January 1989

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The RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

Our Beginners Issue

Hints, Tips and Tutorials for the Absolute Novice

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Program a RAM Disk

Bill Barden on Ham Radio

11 New Shorties in Novices Niche

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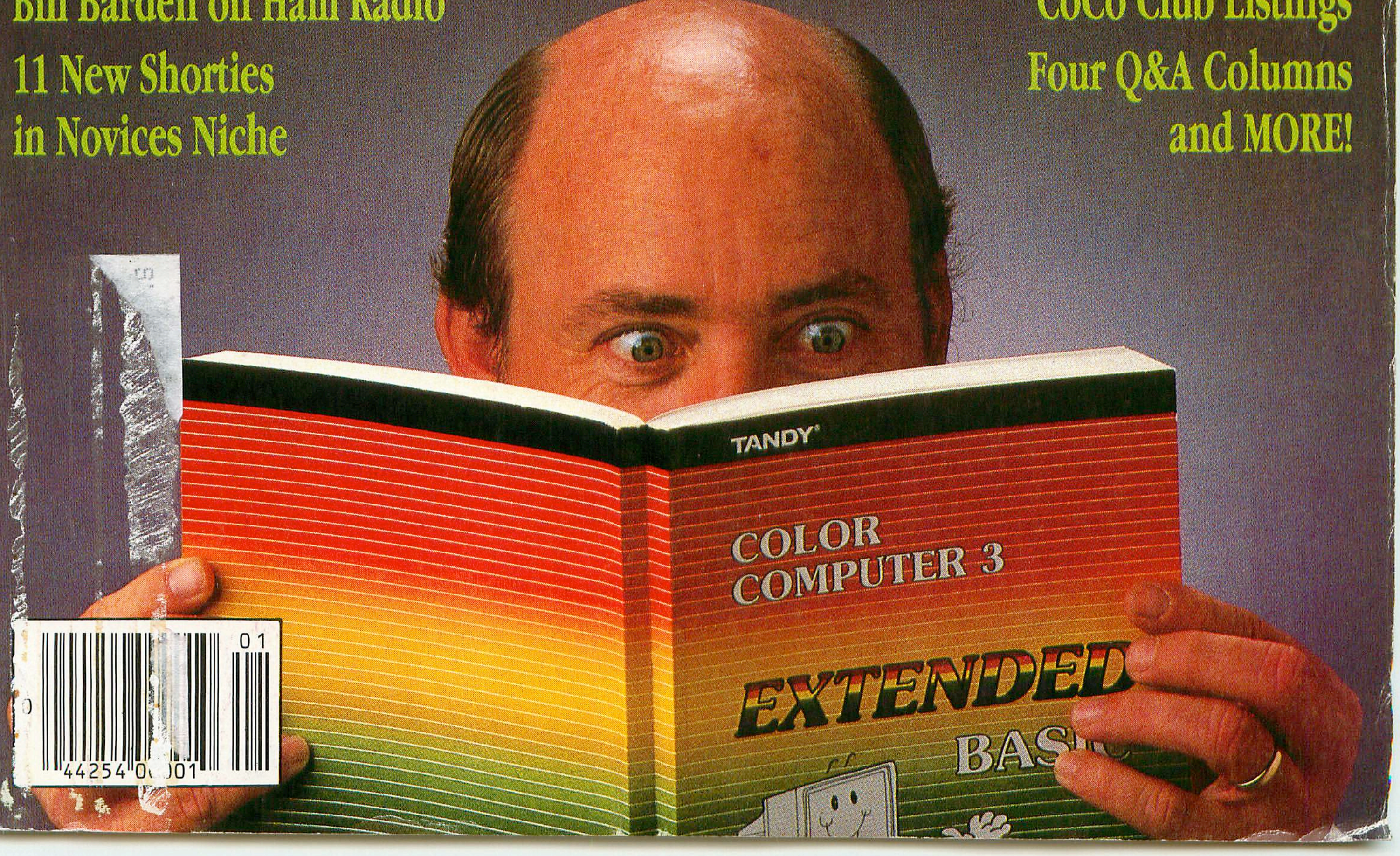

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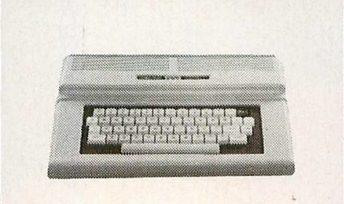

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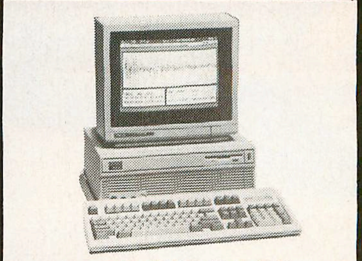

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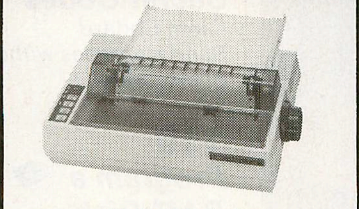

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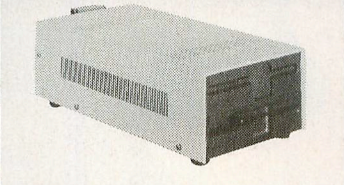

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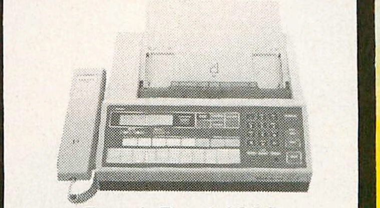

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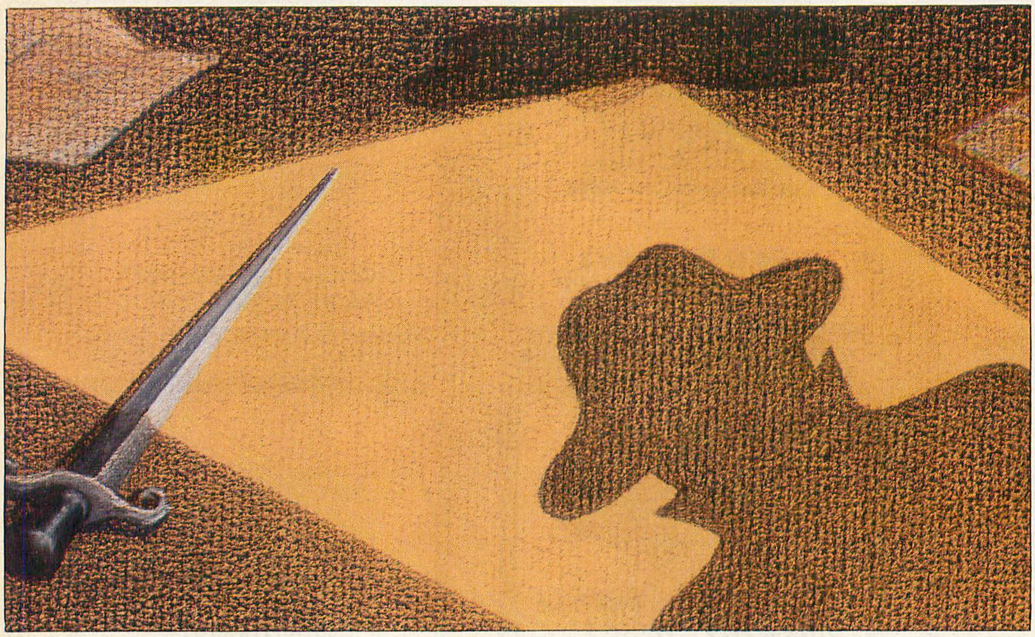
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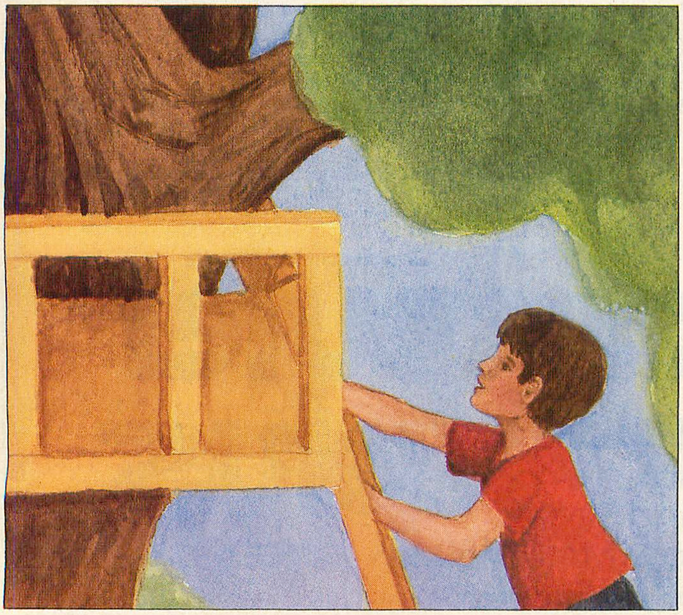
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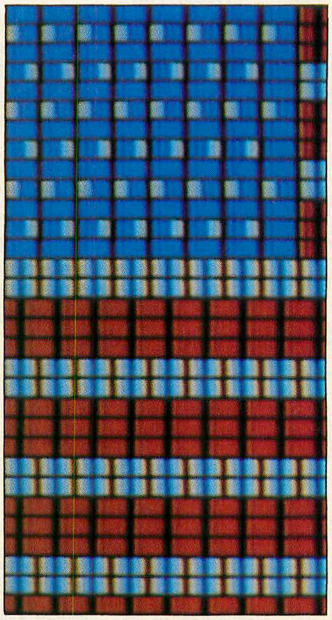

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Letters to the RAINBOW

No Laughing Matter

Editor:

I must take issue with an attitude common among RAINBOW columnists. Some of these writers denigrate some of the more *primitive* CoCo systems. I find this shocking in such an eclectic community as ours. Certainly, some hardware is more powerful or of better quality than other hardware, but comments like Doctor ASCII's reference to one CoCo user's "anemic" FD 501, ignore some important facts.

Single-sided disks are limited, slow and clumsy in comparison to double-sided or hard disks. And when recommending new equipment, one should make these facts clear to help the consumer. But, hey, I *own* one single-drive FD 501. It has served me well, and it may be all I'll ever need. However wonderful other hardware may be, I may never buy it. What I have suits my needs.

You may have three double-sided disks, eight monitors and an ice-cream truck. That's fine if that's what you need. Another person may have a 16K CoCo with a tape drive and use the heck out of it. Great! That's what the CoCo Community is all about.

Don't lay snobbish, wealthier-than-thou trips on financially-strapped CoCo users. It's beneath the dignity of the Community and your magazine to demean fellow CoCo users. In the words first painted on the back of a Model T, *Don't laugh. It's paid for!*

David Smith
Grand Portage, Minnesota

REVIEWING REVIEWS

Editor:

I would like to comment on the review of my program *Castle of Tharoggad* (November '88, Page 130). As the game's programmer, I feel obligated to make a few observations.

It is most unfortunate that the reviewer was neither a D&D fan nor familiar with the game's predecessor, *Dungeons of Daggorath*. His mention of a lack of graphics animation suggests that he did not manage to get far enough in the game to observe the Walls of Fire or other animated sequences scattered throughout the castle. Although these graphics do not stretch the CoCo 3's capabilities, they are more impressive graphics than can be found in CoCo 1 and 2 games.

The reviewer also mentions that the game interface seems slow. I disagree. Anyone who has played D&D games like *Dungeons of Daggorath* or *The Bard's Tale* knows that only a certain number of strikes are permitted to a player before an opponent strikes back. This keeps the game exciting. *Dungeons of Daggorath* was notoriously slow in its keyboard interfacing technique, yet it is one of the most popular program packs written for the CoCo.

The Icon and Menu system used in *Castle of Tharoggad* provides convenient access to every command normally found in Adventures and is probably one of the most striking things about the game. Yet this feature is dismissed as ordinary in the review. How often have you seen fully Icon- and Menu-driven games in a 16K program pack?

Although the review of my program was fair, I do not think that it provided an informed discussion. I suggest that the reviewer play *Dungeons of Daggorath* for a few hours and compare the two games. I think that he will better appreciate *Castle of Tharoggad* feature.

Scott Cabit
West Melbourne, Florida

INFORMATION PLEASE

Editor:

This is written in utter desperation. I bought a CoCo 3 about four months ago, and I am lost. I can't understand 98 percent of your magazine, and when I go to my Radio Shack store, I get more confused. I decided to get a modem (even though I don't know how you use one), so I talked to a man at Radio Shack. He said I would have to build my own cable and that an article in the November issue of THE RAINBOW ("The Computer Connection," Page 28) would help.

I drove 30 miles to get a magazine that I cannot understand. You need to run about two pages every month that offer the complete novice a basic foundation from which to build. (I mean, what is Delphi? Why do you poke and peek?) Thanks for listening.

Ron Hengerer
12412 Teal Run Ct.
Jacksonville, FL 32258

See "Do You Have a Question" by Cray Augsburg (Page 50, this issue) for the answers to some of your questions.

Although we try to include helpful novice information in every issue of THE RAINBOW, *our January issues are strictly devoted to beginners. You might want to check out our back issue ad on Page 107 of this issue.*

Last year's Beginners Issue is one of the most informative. You might want to check out Lauren Willoughby's "Starting From Scratch" (Page 20), an abundance of tips for the new computer user and Lee Veal's "Glossary of Computer Terms" (Page 85), to get a handle on computer jargon.

Don Hutchison's "Getting Started With Delphi" (November '87, Page 64) should answer your questions regarding Delphi and telecommunications.

A Fix for the *Home Publisher*

Editor:

I own a CoCo 3, and I love THE RAINBOW. I have confidence in your magazine, so when in April '88 your "Received and Certified" department (Page 140) certified *Home Publisher* from Tandy, I was sold on it. Unfortunately, according to Tandy, *Home Publisher* will not print on the DMP-130A as promised. I've telephoned the company about this problem. I've been told there is a *bug* in the program and that it won't work with the DMP-130/130A.

The software is super; it just won't print. I really want to use the program, but I am not going to buy a new printer to do so.

Will you please verify this complaint? If it is true, please let others know of this problem. Also, does Radio Shack plan to do anything about this problem? Please help.

Melvin D. Hayden
P.O. Box 477
West Carrollton, OH 45449

Tandy has fixed the Home Publisher*'s problem with the serial driver on the DMP-series printers. To get a copy of the fix at no charge, call Tandy's Computer Customer Service line at (817) 338-2395.*

Tandy has also made additional printer drivers available for use with Home Publisher. *The drivers are for the Epson MX-80, Okidata 20, Panasonic KX-P1090, Star SG-10 and C.Itoh 8510 AP printers. The package (Cat. No. 90-0911) includes all seven printer drivers, retails for $19.95 and may be purchased by calling Express Order at (800) 321-3133, or through any Radio Shack store.*

Welcome Back

Editor:

I bought the CoCo when my sons were quite young. Now that they are old enough to understand how to run programs, we have returned to the CoCo and have quite a bit of fun together.

My interests in the CoCo are recreational. After looking over your October '88 issue, I see that CoCo is no longer as game-oriented as it was in '83. While I realize that computers are first and foremost "working tools" and that games are secondary, I have enough work to do at the office. At home, I look forward to using my CoCo for fun.

Back when I particularly enjoyed graphics Adventures, I had hours of fun with *Sea-Quest* from Mark Data Products. Now THE

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RAINBOW seems almost devoid of such product ads.

However, I did notice in the October issue that you have kept track of software rights after the original distributor has gone out of business (e.g., you explained what has happened to Glen Dahlgren since Prickly Pear Software closed). Is it possible to publish lists identifying who now distributes certain programs? I am particularly interested in games once distributed by the following companies: Tom Mix Software, Datasoft, Inc., ColorQuest, Petrocci Freelance Associates, Elite Software, Adventure International, Rainbow Connection Software, Mark Data Products, Computer Shack, Spectral Associates, Genesis Software, Saguaro Software and Aardvark Ltd.

Finally, I live near Princeton, but I picked up THE RAINBOW too late to go to the RAINBOWfest. Will RAINBOWfest be in Princeton again next year?

Art McTighe
186 Maple Shade Ave.
Trenton, NJ 08690

To the best of our knowledge, the majority of the software companies you mention went out of business years ago and are no longer marketing software for the Color Computer. However, Microcom Software is presently advertising some of the game software formerly marketed by Tom Mix, Mark Data and Spectral Associates; and Cinsoft is currently advertising products marketed previously by Tom Mix and Elite Software. Computer Shack is back in the CoCo market and is advertising its products under the company name MichTron. See its ads for more detail.

Due to the need for more reasonable hotel accommodations, we have moved the October 20 to 22, 1989, RAINBOWfest location from the Hyatt Regency in Princeton to the Somerset Hilton in Somerset, New Jersey, just 30 miles north of Princeton and closer to the Newark airport.

KUDOS

Editor:

I am writing to thank everyone at Colorware for the service I was provided. I wish I had gotten the names of all the people I spoke to so I could mention them specifically, but I was remiss.

My parents ordered both *Max-10* and *CoCo Max III*. However, when I tried to make the necessary backup copies, I could copy only parts of the disks.

I was apprehensive when I called Colorware for replacement because of my dealings with another company. It soon became obvious that my fears were unfounded. The person with whom I spoke was polite and helpful, and he promised to send me replacement disks by the end of the day. Today, less than one week later, I have received the replacement disks and successfully copied them both.

I received outstanding service from Colorware, and I want the people at Colorware and all RAINBOW readers to know.

Charles F. Phillips
Palms, California

HINTS & TIPS

Editor:

When moving from the CoCo 2 to the CoCo 3, I learned that some favorite pokes were not supported in Extended Color BASIC. One of these, the "Wallpaper" poke, was especially missed. Pattern painting can be very useful and economical for backgrounds and shadows in BASIC pictures. Using `POKE 178,`*x* (where *x* is a number between one and 255) and the default `PAINT` command, `PAINT(`*x,y*`),,0`, the CoCo 2 could paint and draw in a vertical patterns. CoCo 3s cannot do this without additional code. However, after disassembling the `HPAINT` I found two pokes that could enable this vertical pattern. To use this poke, you will need an RGB monitor. The following short program uses these two pokes to paint a circle; the two pokes following the `HPAINT` command restore the default value:

```
0 'COCO 3 WALLPAPER POKE
1 'BY THOMAS J GEORGE
10 HSCREEN 2
20 HCLS:X=X+1
30 HPRINT (12,5),X
40 HCIRCLE (160,90),40,6
```

```
50 POKE &HE79B,196
60 POKE &HE79C,X
70 HPAINT (160,90),,6
80 POKE &HE79B,212
90 POKE &HE79C,181
100 GOTO 20
```

Thomas J. George
Huntingdon Valley, Pennsylvania

PEN PALS

• I am 17 years old and would like to have pen pals from anywhere in the world. I have a few CoCos, but I use my 512K CoCo 3 with two double-sided drives, which includes a CM-8, CGP-115 printer/plotter, a modem and other stuff. I enjoy programming and making hardware add-ons. I also run a BBS.

Dave Osborne
6533 Le Breton Ave.
Montreal, PQ
Canada H1M 1L4

• I am 16 years old and have a CoCo, disk drive and printer. I prefer pen pals with close to the same setup, unless there's a girl looking for a good pen pal. I promise to write back to all letters.

James Port
Moose Club Park
Goffstown, NH 03045

• I am 26 years old and own a CoCo 3, CCR-81 and an FD 501 disk drive. I have had my CoCo since June, 1988. I would enjoy hearing from anyone about writing programs. I will answer all letters.

Richard Butler
702 North Cass
Box 304
Mt. Ayr, IA 50854

• I am 15 years old and would like to have some pen pals. I have a CoCo 2, one drive, a CCR-82 cassette recorder, DMP-105 printer, a DC Pak modem and a Modem IB. I will respond to all letters.

Chris Weiss
8879 Fontaineblue Blvd., #202A
Miami. FL 33172

• I am 20 years old and looking for pen pals who also have a strong interest in Tandy computers. I have four computers: CoCos 1 and 2, a Tandy 1000, and a PC-6 hand-held. I work for Radio Shack and love to talk about the products. All letters will be answered.

Paul Borninski
27256 Palomino
Warren, MI 48093

• I am 14 years old and have a Tandy 128K computer and two joysticks. I would like pen pals from all over the world. I would like to learn more about computers.

Delaina Ashcraft
Route 1, Box 332
New Edinburg, AR 71660

• I'm 11 years old and looking for pen pals anywhere in the United States who are seriously interested in the CoCo. I have one disk drive, a Multi-Pak Interface, two CoCo 2s and a modem. I will try to answer all letters.

Gordon McLellan III
412 Spruce St.
Manistee, MI 49660

• I would like a pen pal from anywhere. I have a CoCo 2 and 3, a disk drive, two printers, and a cassette recorder.

Ken Cornlhworte
P.O. Box 1473
100 Mile House, BC
Canada V0K 2E0

• I am 16 years old and own a CoCo 3, two disk drives and a cassette recorder. I am interested in CoCo 3 pictures and graphics. I will answer as many letters as possible.

Taya Lee Brown
2803 Pittsfield
Ann Arbor, MI 48104

• I'm 16 years old and have a CoCo 3 and disk drive. Anyone can write; I'll answer all letters.

Heather Deila
1140 Leeds St.
Utica, NY 13501

• I am 28 years old, have a CoCo 3 with a single-sided drive, and enjoy games and Adventures. I'm looking for some reliable pen pals. I know what it feels like to write and get no reply, so I'll answer *all* letters.

Alan Wickwire
1017 Quince
Brainerd, MN 56401

• I'm a 35-year-old tractor trailer driver who would like pen pals from anywhere in the world — any age. I will answer all letters. I love all games and graphics and work with OS-9 and utilities.

Holloway S. Ferber
98 Centerwood St.
North Babylon, NY 11703

• I am 42 years old and looking for pen pals in the United States and around the world. I have a CoCo 3, disk drive, cassette recorder and DMP-130 printer.

Richard Duhaime
8987 Verville
Montreal, PQ
Canada, H2N 1Y2

• I am 14 years old and looking for a pen pal between 10 and 16 years of age who likes playing games and Adventures on the CoCo. I have a CoCo 2 and disk drive.

Renaldo Radler de Aquino, Jr.
Estrada do Carangola 249
25.715 Petropolis, RJ, Brazil

• I am looking for pen pals of all ages who would be interested in swapping information and discussing any problems that we might have. I have a CoCo 2 with disk drives. I am especially interested in letters from my old navy buddies who were in the CoCo Club at Lakehurst, New Jersey.

Ronald Jalbert, Jr.
P.O. Box 486
Fort Fairfield, ME 04742-0486

• I am a 20-year-old man looking for pen pals who have a CoCo 2 or 3. My system includes a CoCo 3, 501 disk drive, cassette recorder and DMP-105 printer. My other interests are sports, baseball-card collecting and photography. I will answer all replies.

Charles Braude
69-10 Yellowstone Blvd.
Forest Hills, NY 11375

• I am 22 years old and have a CoCo 2 (64K) with a cassette recorder and an Atari 130XE with a 1050 disk drive. I would like to contact anyone in any country who likes Adventure games, sci-fi and medieval fantasy, music, or anyone who wants to talk.

Carlo R. DeShouten
301 McNabb Rd.
Cullman, AL 39055

• I am 15 years old and looking for pen pals from Australia, New Zealand, the United States and Canada. I have a 128K CoCo 3, two double-sided disk drives, a CCR-81 cassette recorder and a DMP-106 printer. I would like to learn OS-9 and assembly language.

Chris Rankin
35 Birchwood Blvd.
Deer Park, Victoria 3023
Australia

• I am a 16-year-old student currently working on my fourth year of Spanish. I would like to correspond with other CoCoists from around the world, especially ones who speak Spanish fluently. I have a CoCo 3, disk drive and printer.

Kevin A. Armalay
586 Webster Ave.
Penndel, PA 19047

• I am 16 years old and interested in a pen pal. All letters will be appreciated.

Christie Goedert
Rt. 3 Box 265
Stockton, MO 65785

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

Word Power 3.2

More Versatile • More Powerful With
Spooler • Calculator • Split-Screen • 2-Column Printing

> *"... friendly...amazing execution speed...much easier to use than VIP software & 2 other word processing systems I've tried...very user-friendly...massive text storage capacity ...highest among word processors..."* - **Rainbow Oct. 88 Review for Word Power**

Unparalleled Power packed in this 100% ML Word Processor written from scratch for the CoCo 3! **No other word processor offers such a wide array of features that are easy to learn & use.**

DISPLAY & SPEED

Word Power 3.2 runs at double-clock speed and uses the **true 80-column display** with lowercase instead of the graphics screen. The result is lightning fast screen reformatting and added speed! **All prompts are displayed in plain English in neat colored windows**. The current column number, line number, page number, percentage of free memory is displayed at all times. Even the **page break** is displayed so you know where one page ends and the other begins. The Setup program allows you to change fore/background colors as well as (in)visible carriage returns. Word Power 3.2 can be used with RGB/Composite/Monochrome monitors as well as TV.

MAXIMUM MEMORY

Word Power 3.2 gives you **over 72K** on 128K and **over 450K** on 512K CoCo 3 for Text Storage - more memory than any other CoCo word-processor. Period.

EFFORTLESS EDITING

Word Power 3.2 has one of the **most powerful and user-friendly full-screen editor with word-wrap.** All you do is type. Word Power takes care of the text arrangement. The unique **Auto-Save** feature saves text to disk at regular intervals for peace of mind.

Insert/Overstrike Mode (Cursor Style Changes to indicate mode);OOPS Recall during delete;Type-ahead Buffer for fast typers;Key-Repeat (adjustable); Key-Click; 4-way cursor and scrolling; Cursor to beginning/end of text, beginning/end of line, top/bottom of screen, next/previous word; Page up/down; Delete character, previous/next word, to beginning/end of line, complete line, text before/after cursor; Locate/Replace with Wild-Card Search with auto/manual replace; Block Mark, Unmark, Copy, Move & Delete; Line Positioning (Center/Right Justified); Set/Reset 120 programmable tab stops; Word-Count; Define Top/Bottom/Left/Right margins & page length. You can also highlight text (underline-with on-screen underlining, bold, italics, superscripts, etc.). Word Power even has a **HELP** screen which an be accessed any time during edit.

SPLIT-SCREEN EDITING

Splits the screen in half so you can view one portion of your text while you edit another. You'll love it!

MAIL-MERGE

Ever try mailing out the same letter to 50 different people? Could be quite a chore. Not with Word Power 3.2! Using this feature, you can type a letter, follow it with a list of addresses and have Word Power print out personalized letters. It's that easy!

CALCULATOR

Pop-up a 4-function calculator while you edit! Great for tables!

SAVING/LOADING TEXT

Word Power 3.2 creates ASCII format files which are compatible with almost all terminal/spell-checking & other word-processing programs. Allows you to Display Free Space, Load, Save, Append & Kill files. The ARE YOU SURE? prompt prevents accidental overwriting & deletion. You can select files by simply cursoring through the disk directory. Supports double-sided drives & step-rates.

PRINTING

Word Power 3.2 drives almost any printer (DMP, EPSON, GEMINI, OKIDATA, etc). Allows options such as baud rates, line spacing, page/print pause, partial print, page numbering/placement, linefeeds, multi-line headers/footers, right justification & number of copies. The values of these parameters & margins can be changed anytime in the text by embedding Printer Option Codes. The **WHAT YOU SEE IS WHAT YOU GET** feature allows you to preview the text on the screen as it will appear in print. You can view margins, page breaks, justification & more.

PRINT SPOOLER

Why buy a hardware Print Spooler? Word Power 3.2 has a **built-in Spooler** which allows you to simultaneously edit one document & print another.

TWO-COLUMN PRINTING

This unique feature allows you to print all or portion of your text in **two columns!** Create professional documents without hours of aligning text.

SPELLING CHECKER

Word Power 3.2 comes with spelling checker/dictionary which finds & corrects mistakes in your text. You can add words to /delete words from dictionary.

PUNCTUATION CHECKER

This checker will proofread your text for punctuation errors such as capitalization, double-words, spaces after periods/commas, and more. Its the perfect addition to any word processor.

DOCUMENTATION

Word Power 3.2 comes with a well-written instruction manual & reference card which makes writing with Word Power a **piece of cake!** Word Power 3.2 comes on an UNPROTECTED disk and is compatible with RSDOS. Only **$79.95**

(Word Power 3.1 owners can get Word Power 3.2 Upgrade FREE by sending proof of purchase & $5.00 to cover S&H costs & instructions)

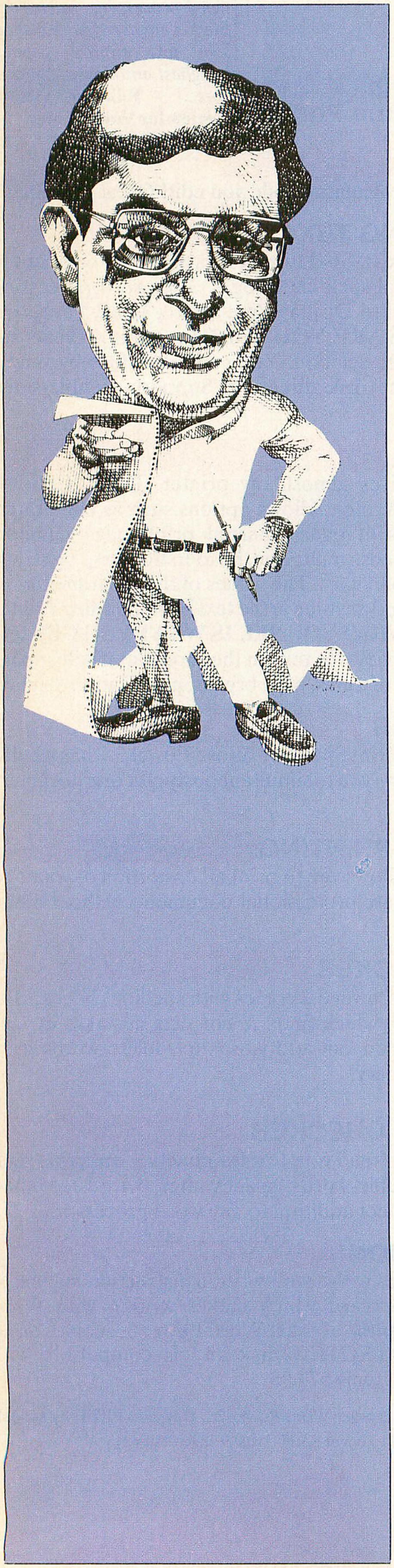
MICROCOM SOFTWARE

All Word Power 3.2 orders shipped by **UPS Next Day Air** at no extra charge within the Continental US. Offer good thru January 15, 1989.

To Order & for info on FREE Gifts: Refer to Page 17 of our 6-page Ad series(Pgs. 9-17)

Credit Card Toll Free Orderline 1-800-654-5244 (9am-8pm 7days/week)

Order Status, Info, Technical Info: 716-383-8830



Starting the Year Off Right

This being our January issue, it is time to welcome many new members of the CoCo Community to our ranks. Based on the sales projections Radio Shack has made for the CoCo this year (which, incidentally, have been very accurate over the years), there are tens of thousands of new CoCo owners who saw what we all know is the finest home computer waiting among their holiday presents.

That's a big moment for lots of people. As many of you know, a CoCo can change your life, making things easier for you and bringing a great deal of enjoyment to every member of your family. But just how all this happens depends on people like you and me.

It's time for a stop at the local Radio Shack store. Meet someone you don't know who has a CoCo. Offer some help if you can. If you have a user group, ask the store manager if you can post a meeting notice somewhere — or at least ask him or her to pass out some flyers. (And make those flyers fancy — it's a good chance to let your CoCo strut its stuff!)

For our part, Radio Shack has for some time now included a subscription envelope with all its new CoCo 3s, so new users have an opportunity to hear about and from THE RAINBOW. For the first time, this year there is an added incentive for new users to get involved with the CoCo Community. In cooperation with Radio Shack, we will be giving away one free copy of THE RAINBOW to each person who buys a new Color Computer 3. The form is included in the box — all the owner has to do is fill it out. This program is expected to continue throughout the year.

I know many of you have encouraged your friends to buy Color Computers this year and have often loaned your copies of THE RAINBOW to them for a while. Now they can get their own — and of course we hope they will join the ranks of our subscribers.

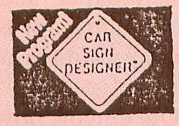
Obviously, there will be some delay in getting these magazines to new owners. The way the program works is that the cards will first have to be sent to Radio Shack in Fort Worth for processing. Then they'll come to us, and we will send out the magazines with the next available issue — which saves us some postage on the mailings.

It is being done this way for a couple of reasons, and I thought you might like to know what they are. First, the offer of a free copy of THE RAINBOW is attached to the warranty card — and Radio Shack does want to encourage return of warranty cards. Our cooperation was asked as an incentive for new owners to do this.

Second, this program is also being used with all of Tandy's MS-DOS and portable computers in cooperation with our sister publication, PCM, which covers those computers. So Tandy has to physically sort the cards in Fort Worth before sending them on to us.

Max-10™

Best Desktop Publishing / Document Creator for the CoCo 3. Features Pull Down Menus, What You See Is What You Get , UNDO, integrated text & graphics capability , multiple fonts & more. Graphics can be imported from CoCo Max I,II,III, MGE, MGF, 5 Level DS-69, PMODE 4, HSCREEN 2/3 pictures. Supports: DMP 105/130, EPSON MX/FX/RXLX/ Gemini 10 Series, CGP-220 and OKI-92. Only **$79.95**



Create distinctive bright yellow diamond shaped car signs. Includes 2 resuable clear plastic sign holders with suction cups, and 50 sheets of bright yellow fan-fold paper. Printer Requirements are the same as for the CoCo Graphics Designer. Only **$29.95**

Font Disk #1,#2 for CoCo Graphics Designer: $19.95 each

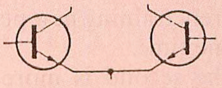
COLOR SCHEMATIC DESIGNER

By Prakash Mishra

An excellent Circuit Schematic Design Software Package for CoCo 3. Features:

*** Runs in 640x192 at 1.8 Mhz**
*** Pull Down Menus**
*** Keyboard/Mouse/Joystck Support**
*** RGB/ Composite/Monochrome Monitor Support**
*** 72 Modifiable Symbols**
*** Multiple Hi-Res Fonts**
*** Multiple UNDO Command**
*** Symbol Rotate/Line/Box Draw**
*** Supports 3 Layers of Circuits**
*** Powerful Screen Print Command for DMP/Gemini/Epson Printers**
*** Complete Documentation**

Only $39.95



RSB

A Revolutionary Program that allows you to use **Basic** Programs from **OS9!**

OS9 Level 2 is the future of the CoCo. Unfortunately, most Basic Programmers are "afraid" of using OS9 because it is completely different from Basic.

Introducing RSB from Burke & Burke. It converts RS-DOS into an OS9 "shell" and allows you to program in Basic from under OS9! You can even take advantage of the OS-9 "built-in" windows to *run several* BASIC programs at once! And RSB always runs at the full 2 Mhz speed of the CoCo!

If you're new to OS9 or you simply want to take advantage of the advanced features of the OS9 operating system, RSB is for you. Req. OS9 L II. Only **$39.95**

ULTRAPATCH SYSTEM

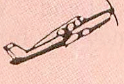
by Randall Reid

Patches the Superpatch EDTASM + ® for 80 columns, 47K Buffer (approximately 3000 lines!) & more. Req CoCo 3. Only **$19.95**

GAMES

(Disk only)
(CoCo 1,2 & 3 except where mentioned)

WARRIOR KING (CoCo 3): $29.95
IN QUEST OF STAR LORD(Animated Graphics Adventure for CoCo 3): $34.95 **Hint Sheet**: $3.95
HALL OF THE KING 1,2,3: $29.95 Each **Trilogy**: $74.95
FLIGHT 16: $34.95
P-51 MUSTANG SIMULATION: $34.95
WORLDS OF FLIGHT: $34.95
PYRAMIX(Cubix for CoCo 3): $24.95
KUNG FU DUDE: $24.95 **CHAMPION**: $19.95
WHITE FIRE OF ETERNITY: $19.95
QUEST FOR THE SPIRIT STONE (CoCo 3): $18
WARGAME DESIGNER (CoCo 3): $29
TREASURY PACK#1: Lunar Rover Patrol, Cubix, Declathon, Qix, keys of Wizard, Module Man, Pengon, & Roller Controller.Only $29.95
TREASURY PACK #2: Lancer, Ms. Gobbler, Froggie, Madness & Minotaur, Ice Castles, Galagon, Devious. Only $29.95
SPACE PAC: Color Zap, Invaders, Planet Invasion, Space Race, Space War, Galax Attax, Anaroid Attack, Whirlybird, Space Sentry & Storm Arrows.Only $29.95
WIZARD'S CASTLE: A hi-res graphics adventure game filled with traps, tricks, treasures. Only $19.95
CLASSIC PAK: Treasury Pack 1, 2, Space Pac & Wizards Castle: Only $59.95



XENOCOPY-PC

An amazingly versatile program that allows you to Format/Duplicate / Read/ Write disks from over 300 different computers. For example you could transfer programs between CoCo, IBM, PC-DOS, TRS-80 Model 3, TRS-80 Model 4, TRS-80 Model 100, Xerox 820, Zenith, Kaypro II, Novell , NEC DOS and much much more!! Send for FREE List. Requires an IBM Compatible with 2 drives. Disk $79.95.

512K BACKUP LIGHTNING

(From Colorventure)
The ultimate CoCo 3 disk copying utility!! Reads your master diskette once and then makes as many copies as you want. It automatically formats an unformatted disk while copying! Supports 35, 40 or 80 track drives with various step rates. A must for any disk user!! Only $19.95

PRINTER LIGHTNING

(From Colorventure)
Never wait for your printer again!! This Print Spooler allows you to print to your printer and simultaneously continue with your programming. No need to wait for those long printouts! Disk Only $19.95

BASIC FREEDOM

A Full Screen Editor for Basic Programs!! A Must for anyone who writes Basic Programs. Only $24.95

VOCAL FREEDOM

Turn your computer into a digital voice / sound recorder. Produces natural voices/ sound effects. Req. inexpensive RS Amplifier (#277-1008) & any microphone. Only $34.95

HACKER's PAC

Allows you to incorporate voices created by Vocal Freedom into your own Basic and ML programs. Only $14.95

MICROCOM SOFTWARE VISA MasterCard AMERICAN EXPRESS DISCOVER

UPS 2ND DAY AIR

To Order & for info on **FREE Gifts:** Refer to Page 17 of our 6-page Ad series(Pgs. 9-17) ➡

Credit Card Toll Free Orderline 1-800-654-5244 (9am-8pm 7days/week)

Order Status, Info, Technical Info: 716-383-8830

I hope you will encourage new owners in several ways. First, and most important, encourage them to become members of the CoCo Community, to learn, to participate and to see what a difference a CoCo will make to them and to every member of their families. You and I know the difference, but try to think back to the day you first opened the box of your Color Computer. Right now, today, there are thousands and thousands of people in exactly that same boat!

Second, please encourage all the new CoCo owners to subscribe to THE RAINBOW. As our ranks become larger, we have more and more clout with a most important segment of the computer industry — the people who develop and write software and hardware. When these people look at a market, they have to see potential for profit; otherwise, they just look for another market.

Third and very important, patronize our advertisers and be sure to mention THE RAINBOW when you do. I know this sounds like a cliche, but you have no idea how important it can be. Yes, of course it is important to us — but it is also important to you, because increased advertising keeps us able to provide the level of support for the CoCo and the CoCo Community we always have.

* * *

All of us make resolutions at this time of the year, and we've made one here at THE RAINBOW, too. For all sorts of reasons, we have had some difficulties this year getting your copies of THE RAINBOW, RAINBOW ON TAPE and RAINBOW ON DISK out to you as fast as we would like.

One of those reasons involved a change in printers at midyear without a lot of notice to us. Our long-time printer was sold to another local firm. In the end, the result of this has mostly been good — we have been able to polybag (and protect) your issues better for about the same cost of the wrapper used in the past. On the bad side, our transition, which was very sudden, took a while to accomplish.

Because we needed to establish some new ways of doing things, which initially took longer, we ended up also pushing back our production of RAINBOW ON TAPE and RAINBOW ON DISK, since these cannot be done until the magazine is "put to bed." Then, in addition, we had some difficulties with the people who duplicate our disks. We believe these problems are solved.

Finally, we've had some real trouble in our typesetting area — primarily because of personnel. We're about to get those problems ironed out, for two reasons. The first of them is a simple one: merely training new people. It does take some time.

But the second is more interesting. Although we have something like $100,000 worth of typesetting equipment, it is pretty outdated (although only a few years old). Just a few weeks ago, we signed a contract for new state-of-the-art laser typesetting equipment from a company called Linotype. It should be delivered by the time you read this.

The new system will involve CoCos and Tandy PCs on the "front end." We expect to save some money on both supplies and maintenance —the former because we will be able to proof on plain paper instead of expensive photographic typesetting paper, and the latter simply because the components of the new system are easier to keep in working order.

Yes, yes, I know: Conversion from one system to another takes time. We know this, but the truth of the matter is that much of what we do will be done the way we do it now — typing and transferring stories and doing editing on our CoCos and Tandy computers. The difference is that we'll then do most of our page layout electronically (at almost 1,800 dots per inch), make all our corrections on plain paper, and output directly to film to send to our printer.

It's an interesting and ambitious project that will, of course, have a learning curve. Our intent, however, is to continue improving THE RAINBOW and providing you with a high-quality magazine. Our New Year's resolution is to provide it and our magnetic products in a more timely manner.

The really good news is that with the savings we will see from these changes, we do not anticipate having to raise subscription prices in 1989, at least in the United States. This is the third year we have been able to hold the line on them. Considering the postage increase this year, I think this says something not only for our dedication to you, but also for the dedication of all the people who work here in their efforts to bring you a quality product at a reasonable cost.

So from all of us to all of you: Happy 1989!

— Lonnie Falk

Introducing **CoCo MIDI 3**! The familiar MIDI sequencer is more powerful than ever! No other sequencer program for the Color Computer can rival the ease of use and powerful editing capabilities. In addition to high performance recording and playback, CoCo MIDI 3 has extensive editing capabilities. Such as block cut, copy, and paste. Quantize a block; scale velocities or a controller value; change the channel assignment of a block. Multipak or Y cable required. Includes a hardware MIDI interface and cables. $149.95

Lyra Lybrary is an extensive collection of music to use with your MIDI synthesizer. There are over 13 disks you can choose from. Each is packed with 5-8 part music, and takes 50 to 80 minutes to play. A wide variety of music ranging from Bach and Chopin to Bing Crosby and the Beatles. Each disk $14.95.

Lyra, a powerful yet easy-to-use MIDI music composition program, is now better than ever! Version 2.6 has almost all the features you might want, including on-screen transpose, programmable MIDI filter, and comprehensive support of the MIDI standard. Many professional musicians use Lyra as a part of their recording studio, and music teachers find it a great aid to teaching music theory in schools! Use Lyra to transcribe, arrange, or compose music and then play it back on your MIDI synthesizer. Comes with CoCo to MIDI cable. Only $59.95.

Rulaford Research
P.O. Box 143
Imperial Beach, CA 92032
(619) 690-3648 (evenings 6-10 PT)

FB-01 Calc is a program that creates event files for Lyra so you can set up custom configurations for your FB-01 from Lyra. Includes a manual packed with useful information about your FB-01. A must if you have an FB-01! $19.95.

Ordering information: send check or money order. Sorry, no credit cards. COD is ok. Shipping and handling included in price. CA residents add 6% tax.

COCO 3 UTILITIES GALORE

(CoCo 2 Versions Included where specified)

SUPER TAPE/DISK TRANSFER

* Disk-to-Disk Copy * Tape-to-Disk Copy
* Tape-to-Disk Auto Relocate
* Disk-to-Tape Copy * Tape-to-Tape Copy
Copies Basic/ML/Data Files. CoCo 1,2 or 3. Req. min. 64K Disk System. Disk Only **$24.95**

COCO CHECKER

Something possibly wrong with your CoCo? CoCo Checker is the answer. Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-Pak Interface and more! Only **$24.95**

DISK UTILITY 2.1A

A multi-featured tool for USER FRIENDLY disk handling. Utilize a directory window to selectively sort, move, rename & kill file entries. Lightning fast Disk I/O for format, copy & backup. Single key execution of Basic/ML programs. This will become your MOST USED program !! CoCo 1,2 or 3. Req. Min. 64K. Disk Only **$24.95**

MAILLIST PRO

The ultimate mailing list program. Allows you to add, edit, view, delete, change, sort (by zipcode or name) and print labels. Its indispensible!! Disk **$19.95** (CoCo 2 version included)

DISK LABEL MAKER

Allows you to design professional disk labels! Allows elongated, normal and condensed format for text. Double Strike, Border Creation, and multiple label printing. Its a MUST for any user with a disk drive. Supports DMP 105/106/110/120/ 130/430, GEMINI, STAR, EPSON and compatibles. (CoCo 2 version included). Only **$19.95**

COCO UTIL II

COCO-DOS MS-DOS

(Latest Version): Transfer CoCo Disk files to IBM compatible computer and vica-versa. Requires 2-Drive IBM Compatible. Disk **$39.95**

RGB PATCH

Displays most games in color on RGB monitors. CoCo 3 Disk **$24.95**

COMPUTERIZED CHECKBOOK

Why bother with balancing your checkbook? Let the CoCo do it for you. Allows you to add, view, search, edit, change, delete and printout (in a table/individual entry format) checkbook entries. Updates balance after each entry. Allows files for checking, savings, and other accounts. Disk **$19.95.** (CoCo 2 version included)

BOWLING SCORE KEEPER

An excellent utility to keep track of your bowling scores. Allows you to save scores under individuals or teams. You can edit change, delete, and compare scores. A must for anyone who wants to keep track of his or her bowling performance. Disk $19.95 (CoCo 2 version included)

VCR TAPE ORGANIZER

Organize your videotapes with this program. Allows you to index tapes by title, rating, type, play time and comments. Also allows you to sort titles alphabetically & view/print selected tapes. If you own a VCR, this program is a MUST!! Disk $19.95 (CoCo 2 version included)

COCO 3 SCREEN DUMP

Fantastic

32, 40, 80 column text dump, PMODE 4 Graphics Dump. Single Keystroke Operation allows you to take snapshots of your screens even when programs are running! Works on DMP's, Epson, Gemini and compatibles. CoCo 1, 2 and 3. Disk **$24.95**

HOME BILL MANAGER

Let the CoCo keep track of your bills. Allows you to enter bills under various categories and reminds you when they are due. Disk **$19.95**

CALENDAR MAKER

Generate monthly calendars on your printer for any year in the 20th century. Disk Only **$19.95** (CoCo 2 version included)

ADOS 3

Advanced disk operating system for CoCo 3. Comes on disk and is EPROMable!! Disk **$34.95. ADOS** (for CoCo 1,2): **$27.95**

OS 9

Start OS9

An Enjoyable, Hands-on Guide to OS9 Level II. Includes step-by-step tutorials, articles by OS9 experts, free software disk includes examples & great OS-9 utilities! Req. 512K, OS9 Level II, 2 drives & monitor. The Hottest OS9 Package. Disk + Book: **$32.95**

The Zapper: Patch Disk Errors.$19.95

Disk Manager Tree: Change, create & delete directories quickly. Req. 512K LII. $29.95

Level II Tools : Wildcards,tree commands, windowing & 22 more utilities. 128K Req.$24.95

Warp One: Complete LII Windowing Terminal. Auto dial, macros,file transfers,capture,timer,chat, etc. 512K Req. $34.95

WIZ

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How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with `ORIGIN` or `EQUATE` statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the `&H3F00` in Line 10 to `&H7F00` and change the value of `I` to `&H7F80`.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: `CMDS` and `SOURCE`. It also contains a file, `read.me.first`, which explains the division of the two directories. The `CMDS` directory contains executable programs and the `SOURCE` directory contains the ASCII source code for these programs. BASIC09 *programs will only be offered in source form so they will* only be found in the `SOURCE` directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the `CMDS` directory, enter `dir cmds`. Follow a similar method to see what source files are in the `SOURCE` directory.
5) When you find a program you want to use, copy it to the `CMDS` directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/`*filename* `/d0/cmds/`*filename* `-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/`*filename* `/d0/cmds/` *filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has actually been seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification.

The Seal is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Rainbow Check Plus

The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command `RUN` and press ENTER. Once the program has run, type `NEW` and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

COCO 3

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THE WORKS

"Your CoCo 3 will think it's a Mac."

GRAPHIC DESIGN / WORD PROCESSING / SPELLCHECKER

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All for $149.95

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Max–10+

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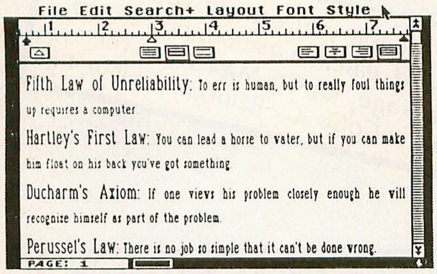
The latest in CoCo word processors and the only one with true WYSIWYG (What You See Is What You Get) output. Mix graphics with text. Max–10 is great for anything from greeting cards up to newsletters. Just turn the next page for a full list of Max–10's unbelievable features.


File Edit Search+ Layout Font Style
1 2 3 4 5 6 7
PAGE: 1

Fifth Law of Unreliability: To err is human, but to really foul things up requires a computer

Hartley's First Law: You can lead a horse to vater, but if you can make him float on his back you've got something

Ducharm's Axiom: If one vievs his problem closely enough he vill recognize himself as part of the problem.

Perussel's Law: There is no job so simple that it can't be done vrong.

Max–10 Font Set

Regularly $29.95

36 fonts on 2 disks. Can all be used easily and quickly with Max–10.

Frontier 18 point
Athens 18 point
Irvine 12 point
Irvine 24
Swan Song 12 point
Swan Song 24
Ellesmere 12 point
Ellesmere 24 point
Ellesmere Bold 24
Digital 12 point

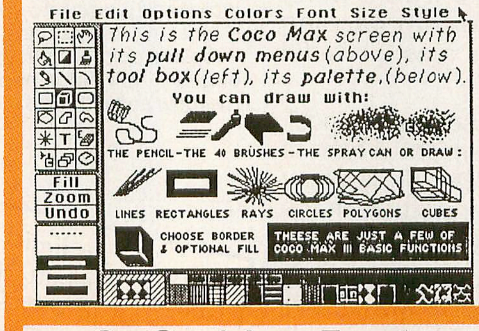
Longhand 24
Hollow 12 point
Hollow 18 point
Rome 9 point
Rome 12 point
Stencil 18 point
Futura 24
Courier 12 point
Brookhaven 18
Thames 18 point
San Francisco 18
Century 24

All these and 14 more!

CoCo Max III

Regularly $79.95

The ultimate graphics creation program. See the list of features on the next page. Also read the superb review in **The Rainbow**, *April 1988*.

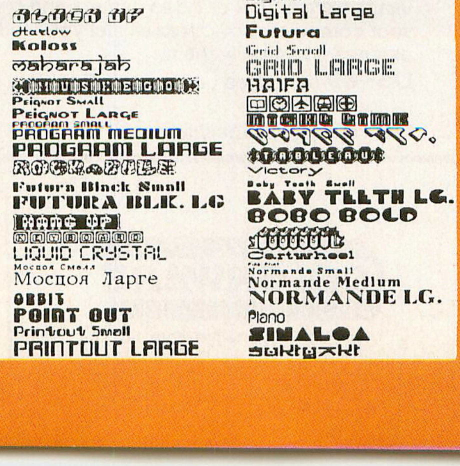

File Edit Options Colors Font Size Style
Fill
Zoom
Undo
You can draw with:
THE PENCIL–THE 40 BRUSHES–THE SPRAY CAN OR DRAW:
LINES
RECTANGLES
RAYS
CIRCLES
POLYGONS
CUBES
CHOOSE BORDER & OPTIONAL FILL
THEESE ARE JUST A FEW OF COCO MAX III BASIC FUNCTIONS

This is the Coco Max screen with its pull down menus (above), its tool box (left), its palette, (below).

CoCo Max Fonts

Regularly $49.95

Almost 100 fonts for incredible headlines and text. Four disks full of fonts. Use CoCo Max styles (Bold, Italic, 3–D, Shadow ...), sizing and colors for absolutely wonderful effects. Thousands of combinations are possible. Here are some of the fonts:


Harlow
Koloss
maharajah
Peignot Small
Peignot Large
Program Small
PROGRAM MEDIUM
PROGRAM LARGE
Futura Black Small
FUTURA BLK. LG
LIQUID CRYSTAL
Мосцоя Смеля
Мосцоя Ларге
ORBIT
POINT OUT
Printout Small
PRINTOUT LARGE
Digital Small
Digital Medium
Digital Large
Futura
Grid Small
GRID LARGE
HAIFA
Victory
Baby Teeth Small
BABY TEETH LG.
BOBO BOLD
Cartwheel
Normande Small
Normande Medium
NORMANDE LG.
Plano
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We understand perfectly that you have no reason to believe anything you read. Including this ad. (Or the rave reviews)

So we invite you to evaluate **The Works** yourself. Call and order it. We'll send it with detailed, clear instructions. Use it with your own CoCo 3, on your own work, for 30 days. Try it for brilliant presentation graphics, outstanding word processing. Wring it out.

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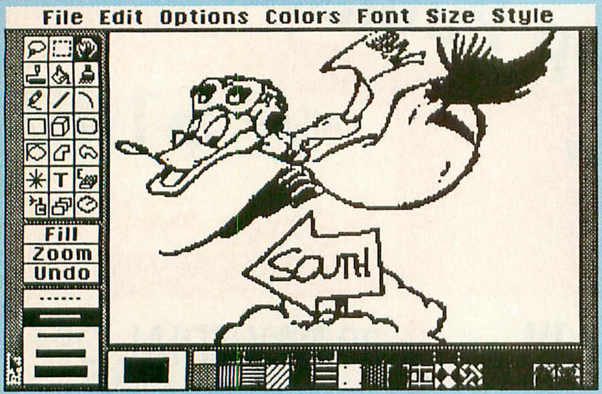
CoCo Max™ III AND



CoCo Max III is absolutely the best drawing package available for the CoCo 3, and it does more than just let you draw. **CoCo Max III** includes animation, text, color mixing and more features than you would think possible. It combines incredible speed with dazzling graphics and it is a joy to use even its most powerful features.

Pictures, graphs, flyers, cards, signs, school projects, labels, buttons and anything else you might dream of creating is now possible with **CoCo Max III**. Is it any wonder that the majority of CoCo Gallery pictures in the last five months were created with **CoCo Max?**

Thousands of CoCo users have found that you don't have to be an artist to have fun with **CoCo Max**. You'll wonder why you waited so long to get the incredible **CoCo Max III**.

CoCo Max III is the best because it includes:
- a huge picture area (*two* full hi-res 320x192 screens) - a large editing window - Zoom mode for detail work - 28 drawing tools which you just point and click on - shrink and stretch - rotation at any angle (1.5 degree steps) - 512K memory support (*all* features work with 128K too) - an Undo feature to correct mistakes - you can even Undo an "Undo" - Animation - special effects - color sequencing (8 colors, variable speed) - thirteen fonts (more available) - each font has eight different sizes - five style options (bold, italic, 3D, etc.) for thousands of font/size/style combination possibilities. - the CoCo Show "slide show" program - color editing of patterns - automatic pattern alignment - prints in single and double size - smart lasso (move text over a background...) - advanced tools: arc, ray, cube, etc. - select 16 of the 64 colors (all 64 colors are displayed at once for selection!) - picture converter (CoCo Max II, MGE, BASIC) - extensive prompting - "glyphic" clipbook of rubber stamps - double click shortcuts - color mixing (additive/subtractive/none) - money back guarantee - sophisticated data compression saves disk space - pull down menus (no commands to remember) - forty paintbrush shapes - two color lettering - spray can - scrapbooks of pictures - error free - Y-cable or multipack not required - high speed hi-res interface included (plugs into joystick port) - disk is not copy protected - amazing "flowbrush" - RGB and composite monitor support - replace color - printing on black and white printers in five shades of gray - full color printing with optional drivers for the NX-1000 Rainbow and CGP220 - entirely rewritten for the CoCo 3

> There are no limits to what you can do with this fabulous program. Speed, ease, animation, power and color, all in one package. **CoCo Max III** is the ultimate program for the CoCo 3. –Rainbow review 4/88

CoCo Max III: $79.95

Max-10 owners: deduct $10

System Requirements:
CoCo 3 disk system and a Joystick or Mouse

Printer drivers included:
IBM/Epson and compatibles, GEMINI, DMP105/106/130, OKI182/192, CGP220 (B&W), DMP110, DMP200

Color printer drivers (prints 125 different colors) Star NX-1000, CGP-220, or Okimate 20 each **$19.95**

For all CoCo Max Versions

Max Edit Font Editor: A font is a set of characters of a particular style. With Max Edit you can create new fonts or modify the existing ones. **$19.95**

Max Font disks (send for list) each **$19.95**

Max Font Set (95 fonts on 4 disks) **$49.95**

DS69/69B Digitizers: allows you to capture the image from a VCR or video camera and bring it into your computer. CoCo Max will let you load digitized pictures and modify them.

DS-69 (2 images per second. Requires multipak) **$99.95**

DS-69B (8 images/second) **$149.95**

CoCo 1 & 2 Owners Still Available:

(See previous ads or write for information)

CoCo Max II (works on all disk CoCos) **$69.95**

CoCo Max Tape (CoCo 1 & 2 only) **$59.95**

Y-Cable **$24.95**

CoCo Max II Picture Disk Set set of 3 disks: **$29.95**

Guaranteed Satisfaction
Use CoCo Max or Max-10 for a full month.
If you are not delighted with either of them,
we will refund every penny.

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Add $3 per order for shipping ($5 to Canada, 10% to overseas)
CT residents add 7.5% sales tax

PUBLISHING

COLORWARE

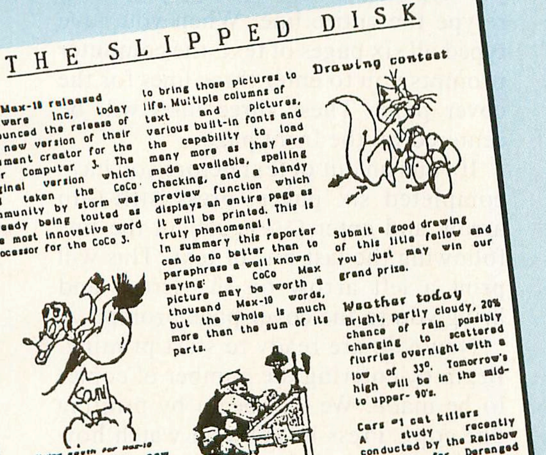
Max-10™

THE DAZZLING WORD PROCESSOR

You probably already have a word processor, and you probably wish it had these features:

- Fully menu driven (CoCo Max style) with point and click marking of text. You don't need the arrow keys!
- True WYSIWYG (What You See Is What You Get) including variable size fonts, styles (bold, italics, etc.) and graphics.
- Can print multiple columns on a page.
- Not limited by printer capabilities: fonts up to 24 points (1/3") high, superscripts, small print, etc.
- Fully integrated spelling checker (incredibly fast), no need to exit program to check spelling.
- Graphics can be imported from just about anything (CoCo Max; MGE; BASIC; even Macintosh pictures from a BBS) and resized to fit your document.
- Full screen preview including graphics.

Max-10 has all these unique features, plus all the features you are used to in your current word processor. Even with all this, you don't give up anything. **Max-10** is easier to use, more intuitive, faster and more powerful than anything else. It's not just a word processor, it's a desktop publisher.



THE SLIPPED DISK

Max-10 released

Colorware Inc. today announced the release of the new version of their document creator for the Color Computer 3. The original version which had taken the CoCo community by storm was already being touted as the most innovative word processor for the CoCo 3.

Flying south for Max-10

Now with this new version, Colorware has brought to the CoCo market something many have been clamoring for: a real desktop publishing system. Coupled with the already sensational CoCo Max III color graphic creator and editor, the new Max-10 can add words to bring those pictures to life. Multiple columns of text and pictures, various built-in fonts and the capability to load many more as they are made available, spelling checking, and a handy preview function which displays an entire page as it will be printed. This is truly phenomenal!

In summary this reporter can do no better than to paraphrase a well known saying: a CoCo Max picture may be worth a thousand Max-10 words, but the whole is much more than the sum of its parts.

Author Dave stamps at work

Drawing contest

Submit a good drawing of this litle fellow and you just may win our grand prize.

Weather today

Bright, partly cloudy, 20% chance of rain possibly changing to scattered flurries overnight with a low of 33°. Tomorrow's high will be in the mid- to upper- 90's.

Cars #1 cat killers

A study recently conducted by the Rainbow Institute for Deranged Stuffed Animals reveals that the vast majority of feline deaths is due to collisions with heavy mid-size family sedans. No information was made

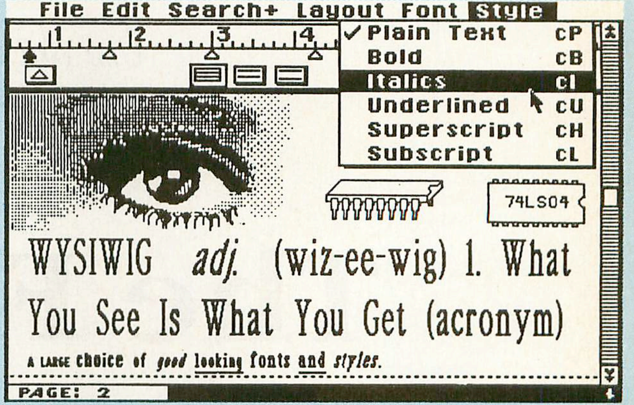
PAGE 1

Max-10: $79.95

CoCo Max III owners: deduct $10

Max-10 requires a CoCo 3, at least 1 disk, & joystick or mouse

Printer drivers included: IBM/Epson and compatibles; DMP 105, DMP106, DMP130; CGP220 (B&W); Gemini/Star



WYSIWIG *adj.* (wiz-ee-wig) 1. What You See Is What You Get (acronym)

A LARGE choice of *good* looking fonts and *styles.*

Some of the many features of **Max-10:**

- Blinding speed - printing in multiple columns - online dictionary - spell checking - graphics can be mixed with text - full justification of proportionally sized characters - bold, italic, underline superscript and subscript type styles - superb file support, just point and click - "Undo" lets you correct mistakes - easy to use, no commands to remember - any graphics program can be used - pictures can be shrunk or stretched to fit - right and left alignment - centering - variable line spacing - page numbering - current page number displayed on the screen - variable tab stops - left and right margins - tabs and margins can vary in the same document - cut and paste text and graphics anywhere in the file - page break shows on the screen - pull down menus are quick and simple to use - lightning fast access to any point in the document with the scroll box - twenty fonts (styles and sizes), more available - any number of character sizes and styles can be mixed on the same line - up to more than 120 characters per line, depending on font size, style and letters - headers and footers, even with graphics - file compatibility with other word processors - right, left, bottom and top margins - word wrap - set starting page - type ahead - key repeat - key click - scroll up and down - ASCII file output for compatibility - disk directory - kill files- block cut, copy and move - global search and replace - paragraph indent - clipboard - merge - show file (on disk) - free memory display - page count - paragraph count - word count - graphics can be resized and moved - multiple fonts - error recovery - true lowercase - 512K memory support (all features work with 128K too) - complete point and click cursor control - moving, clearing and changing blocks of text is ridiculously easy, just point and click at each end of the text block - onscreen ruler - preview file before loading - search and replace - disk is not copy protected - more than 35 pages of text

CoCo Max III and Max-10 Perfect Together

You do not *need* **CoCo Max III** to insert and print graphics in **Max-10**. Max-10 works with any graphics creation program, and you can also use graphics downloaded from bulletin boards.

Similarly, you do not *need* **Max-10** to create graphics with text in **CoCo Max III**. There are tremendous lettering capabilities in **CoCo Max III**, with its many fonts, styles, and sizes.

Together **Max-10** and **CoCo Max III** are an unbeatable combination. This desktop publishing system is better than anything you've ever seen on a CoCo. We are so confident that you will use, and enjoy using the two software packages, that we offer an unconditional money back guarantee. Stop wasting your time and effort using inferior or obsolete products. Move up to the new generation of CoCo software now.

Use one sheet of paper to print a six-page pamphlet

The Flip Side

By Keiran Kenny

Would you like to print a six-page booklet with up to 27 lines per page and 34 characters per line (about 900 words — the length of this article)? You can create such work with my program, *Booklet*. The program should work using any printer with a 1/6-inch linefeed and 80 characters per line. The program works fine on my Brother EP44 typewriter/printer, which uses a ribbon and typing paper.

To see how the program works, let's print a booklet. First, note that Line 80 sets the baud rate at 2400. Change the rate to fit the needs of your computer. Feed the paper into your printer, making sure that the perforation is flush with the top of the ribbon.

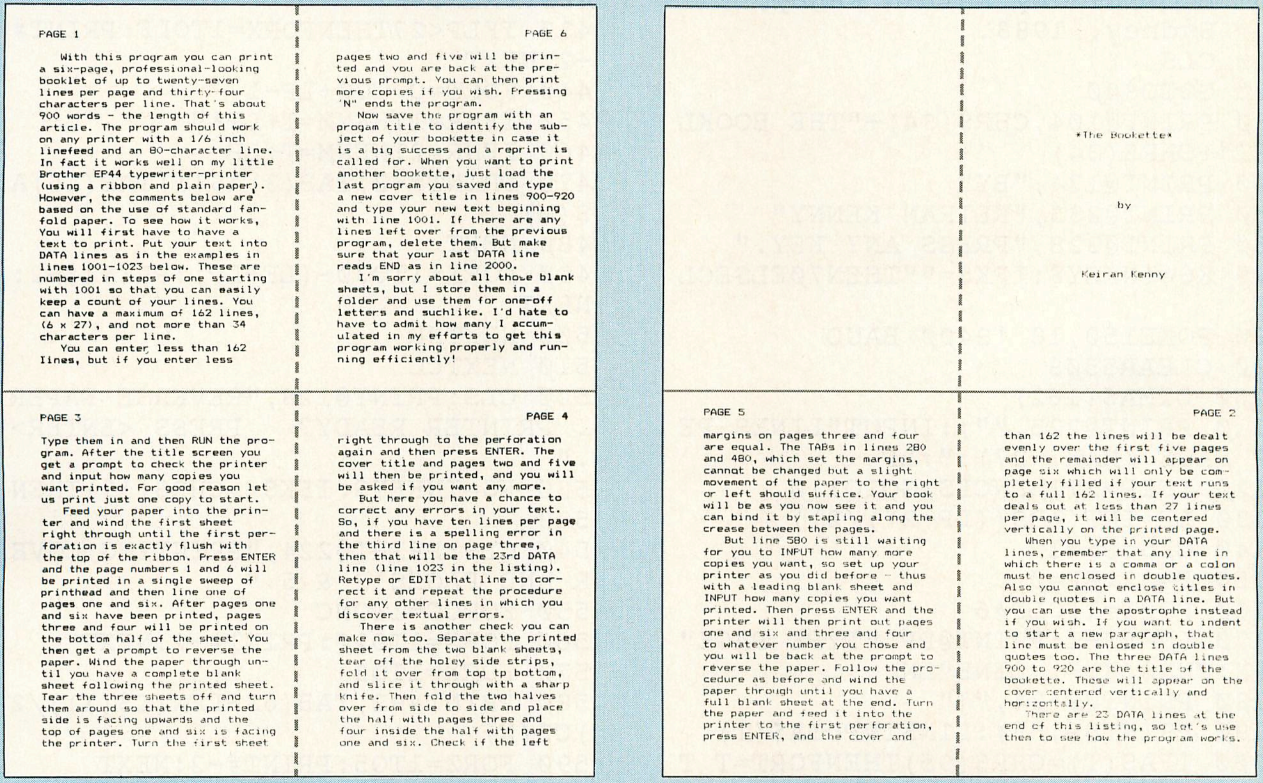
Now turn on your printer and run the program. After the title screen, you will be prompted to enter the number of lines per page. You can enter any number from one to 27. If you choose less than 27, the text will be centered on the page at the final printout. Once you have entered the number of lines, you will be prompted to type each line of text, one by one. You may enter characters until there is only one space before the line limit marker (]), but if you type over the marker, you must retype the entire line. When you have typed all six pages of text, the computer prompts you to enter three lines for the cover page. These three lines will be centered on the front page.

Keiran Kenny started programming seven years after retirement. He is interested in CoCo's graphic and math capabilities and enjoys trying a variety of applications.

If you run out of text before you have completed six pages, press SHIFT-up arrow and enter `CHR$(95)` in the line following the last line of text. This will print a left arrow on the screen and bring you to the cover-page prompt.

Now you are ready to start printing. Begin by entering the number of copies to be made. We will begin by printing one copy. Press ENTER and watch how the printer prints the page numbers one and six in a single sweep. Next, the first line of pages one and six is printed, and so on, until all lines of these two pages have been printed. On the bottom half

Figure 1: Sample printout of *The Booklet*



PAGE 1

With this program you can print a six-page, professional-looking booklet of up to twenty-seven lines per page and thirty-four characters per line. That's about 900 words - the length of this article. The program should work on any printer with a 1/6 inch linefeed and an 80-character line. In fact it works well on my little Brother EP44 typewriter-printer (using a ribbon and plain paper). However, the comments below are based on the use of standard fanfold paper. To see how it works, You will first have to have a text to print. Put your text into DATA lines as in the examples in lines 1001-1023 below. These are numbered in steps of one starting with 1001 so that you can easily keep a count of your lines. You can have a maximum of 162 lines, (6 x 27), and not more than 34 characters per line.

You can enter less than 162 lines, but if you enter less

PAGE 6

pages two and five will be printed and you are back at the previous prompt. You can then print more copies if you wish. Pressing 'N" ends the program.

Now save the program with an progam title to identify the subject of your bookette in case it is a big success and a reprint is called for. When you want to print another bookette, just load the last program you saved and type a new cover title in lines 900-920 and type your new text beginning with line 1001. If there are any lines left over from the previous program, delete them. But make sure that your last DATA line reads END as in line 2000.

I'm sorry about all those blank sheets, but I store them in a folder and use them for one-off letters and suchlike. I'd hate to have to admit how many I accumulated in my efforts to get this program working properly and running efficiently!

PAGE 3

Type them in and then RUN the program. After the title screen you get a prompt to check the printer and input how many copies you want printed. For good reason let us print just one copy to start.

Feed your paper into the printer and wind the first sheet right through until the first perforation is exactly flush with the top of the ribbon. Press ENTER and the page numbers 1 and 6 will be printed in a single sweep of printhead and then line one of pages one and six. After pages one and six have been printed, pages three and four will be printed on the bottom half of the sheet. You then get a prompt to reverse the paper. Wind the paper through until you have a complete blank sheet following the printed sheet. Tear the three sheets off and turn them around so that the printed side is facing upwards and the top of pages one and six is facing the printer. Turn the first sheet

PAGE 4

right through to the perforation again and then press ENTER. The cover title and pages two and five will then be printed, and you will be asked if you want any more.

But here you have a chance to correct any errors in your text. So, if you have ten lines per page and there is a spelling error in the third line on page three, then that will be the 23rd DATA line (line 1023 in the listing). Retype or EDIT that line to correct it and repeat the procedure for any other lines in which you discover textual errors.

There is another check you can make now too. Separate the printed sheet from the two blank sheets, tear off the holey side strips, fold it over from top tp bottom, and slice it through with a sharp knife. Then fold the two halves over from side to side and place the half with pages three and four inside the half with pages one and six. Check if the left

View A

The Bookette

by

Keiran Kenny

PAGE 5

margins on pages three and four are equal. The TABs in lines 280 and 480, which set the margins, cannot be changed but a slight movement of the paper to the right or left should suffice. Your book will be as you now see it and you can bind it by stapling along the crease between the pages.

But line 580 is still waiting for you to INPUT how many more copies you want, so set up your printer as you did before - thus with a leading blank sheet and INPUT how many copies you want printed. Then press ENTER and the printer will then print out pages one and six and three and four to whatever number you chose and you will be back at the prompt to reverse the paper. Follow the procedure as before and wind the paper through until you have a full blank sheet at the end. Turn the paper and feed it into the printer to the first perforation, press ENTER, and the cover and

PAGE 2

than 162 the lines will be dealt evenly over the first five pages and the remainder will appear on page six which will only be completely filled if your text runs to a full 162 lines. If your text deals out at less than 27 lines per page, it will be centered vertically on the printed page.

When you type in your DATA lines, remember that any line in which there is a comma or a colon must be enclosed in double quotes. Also you cannot enclose titles in double quotes in a DATA line. But you can use the apostrophe instead if you wish. If you want to indent to start a new paragraph, that line must be enlosed in double quotes too. The three DATA lines 900 to 920 are the title of the bookette. These will appear on the cover centered vertically and horizontally.

There are 23 DATA lines at the end of this listing, so let's use them to see how the program works.

View B

View A shows the front side of the printed paper (which is printed first) and View B shows the backside. To put the booklet together, first cut the paper horizontally across the middle (solid line). Then, put the two halves together, fold vertically (across the dotted lines) so that the pages are in order and staple the booklet together in the middle.

of the paper, the printer prints the page numbers and all the text for pages three and four.

Once this is complete, you will be prompted to turn the paper over, so you may begin printing on the other side. Turn off the printer and remove that sheet as well as one blank sheet on either side of it. Turn these sheets over so that the printed side will face up. Feed in the leading blank page and align the paper. Press ENTER. The cover page will be printed on the first half of the sheet, and pages two and five will be printed at the bottom. You will then be asked if you want to print more booklets.

Here you have an opportunity to correct any errors before continuing the printing. Tear off the printed sheet and check the pages for errors. Each line is in an array labeled `A(T)`, with each array numbered sequentially. Thus, if you have 10 lines per page, and the third line from the top on Page 5 has a spelling error, the error is in Array `A$(43)`. Press BREAK, to be placed in the *direct* mode. Type `?A$(43)` and press ENTER. The line will appear on the screen. To correct it, enter this:

`A$(43)=`*"corrected text"*

The three cover lines are labeled `C$(1)` to `C$(3)`, and they can be corrected in the same way. When you have finished your corrections, enter `GOTO710`. This returns you to the earlier prompt.

Before you print another booklet, check the one you have finished. Remove the side strips from the printed sheet and cut the paper in half between pages one and six, and pages three and four. Then fold each half-sheet in half again, and check to see if the left margins of pages one and six are equal. Although there is no way to change the margins in the program, you can move your paper farther to the right or left to correct such problems.

To make your booklet, lay your two sheets of paper on top of each other with pages three and four on top and facing up. Fold the two sheets together so that the cover and a blank page are on the outside of the booklet. You can then bind the booklet by stapling the two sheets together. (See Figure 1.)

Return to the program. Line 710 is still waiting for you to enter the number of copies you want printed. So now, as before, line up your paper and then enter the number of copies you want. The printer will print the appropriate number of pages one and six, and three and four. It will then prompt you to remove the paper and turn it over as you did for the first copy.

At the end of this series of copies, the program will ask if you would like to print additional copies. In this way, you can continue making corrections or modifications to your booklet until you are satisfied with the work.

(Questions or comments about this program may be directed to the author at 2/45 Cremorne Rd., Cremorne N.S.W., Australia 2090. Please include an SASE when requesting a reply.) ☐

The listing: BOOKLET

```
0 'BOOKLET' by Keiran Kenny,
   Sydney, 1988.
10 CLS
20 GOTO800
30 PRINT@104,CHR$(34)+"THE BOOKL
ET"+CHR$(34)
40 PRINT@174,"BY"
50 PRINT@233,"KEIRAN KENNY"
60 PRINT@328,"PRESS ANY KEY."
70 K$=INKEY$:IFK$=""THEN70ELSECL
S
80 POKE150,18 '2400 BAUD
90 CLEAR5508
100 DIMA$(162)
110 PRINT@225,"";:INPUT"LINES PE
R PAGE (MAX. 27):";LP
120 IFLP>27THENCLS:GOTO110
130 LF=INT(ABS((LP-27)/2))
140 CLS:PN=1
150 P=32:PP=0
160 FORT=1TOLP*6
170 LN=LN+1:PRINT@PP,"TYPE PAGE"
PN;CHR$(8)", LINE"LN
180 PRINT@P+34,"]"
190 PRINT@P,"";:LINEINPUTA$(T)
200 IFA$(T)=CHR$(95)THENFORT=T T
OLP*6:A$(T)="":NEXT:GOTO270
210 IFLEN(A$(T))>34THENPRINT"TOO
 LONG! TYPE LINE"LN"AGAIN.":PRIN
T@P,STRING$(LEN(A$(T)),32):PRINT
@P+34,"]":GOTO190
220 PRINT
230 P=P+96:PP=PP+96
240 IFLN=LP THENPN=PN+1:LN=0
250 IFPP>=480THENCLS:P=32:PP=0
260 NEXT
270 CLS:PRINT"TYPE 3 LINES FOR C
OVER."
280 P=64
290 FORX=1TO3
300 PRINT@P,"LINE"X
310 LINEINPUTC$(X)
320 IFLEN(C$(X))>34THENCLS:PRINT
"LINE"X"TOO LONG!":PRINT@P,"";:G
OTO310
330 P=P+96
340 NEXT
350 CLS:PRINT@224,"PRINTER READY
? HOW MANY COPIES  DO YOU WANT T
O PRINT";:INPUTNC
360 CLS:PRINT@224,"PRINTING PAGE
S 1 & 6 AND 3 & 4"
370 FORCC=1TONC
380 FORNR=1TO2
390 IFNR=1THENQ=1:PX=1:PZ=6
400 IFNR=2THENQ=LP*2+1:PX=3:PZ=4
410 PRINT#-2:PRINT#-2,TAB(3)"PAG
E"PX;TAB(72)"PAGE"PZ
420 PRINT#-2
430 IFLP<27THENFORX=1TOLF:PRINT#
-2:NEXT
440 FORT=Q TOQ+LP-1
450 IFNR=1THENM=T+LP*5
460 IFNR=2THENM=T+LP
470 PRINT#-2,TAB(3)A$(T)TAB(46)A
$(M)
480 NEXT
490 FORX=1TO30-(LF+LP):PRINT#-2:
NEXT
500 NEXTNR
510 NEXTCC
520 CLS:PRINT@128,"REVERSE PAPER
. PRINTER READY?   PRESS <ENTER>
."
530 K$=INKEY$:IFK$<>CHR$(13)THEN
530
540 CLS:PRINT@224,"PRINTING COVE
R AND PAGES 2 & 5."
550 FORCC=1TONC
560 FORX=1TO10:PRINT#-2:NEXT
570 FORX=1TO3
580 PRINT#-2,TAB(63-LEN(C$(X))/2
)C$(X)
590 FORZ=1TO5:PRINT#-2:NEXT
600 NEXT
610 FORX=1TO6:PRINT#-2:NEXT
620 Q=LP*4+1:PX=5:PZ=2
630 PRINT#-2,TAB(3)"PAGE"PX;TAB(
72)"PAGE"PZ:PRINT#-2
640 IFLP<27THENFORX=1TOLF:PRINT#
-2:NEXT
650 FORT=Q TO Q+LP-1
660 M=T-LP*3
670 PRINT#-2,TAB(3)A$(T)TAB(46)A
$(M)
680 NEXTT
690 FORX=1TO30-(LF+LP):PRINT#-2:
NEXT
700 NEXTCC:TC=TC+NC
710 CLS:PRINT@64,"COPIES PRINTED
 ="TC:PRINT:PRINT"DO YOU WANT MO
RE? Y/N"
720 PRINT:PRINT"(TO CORRECT LINE
S PRESS <BREAK>)"
730 K$=INKEY$:IFK$=""THEN730
740 IFK$="Y"ORK$="y"THENNR=0:GOT
O770
750 IFK$="N"ORK$="n"THENCLS:END
760 GOTO730
770 PRINT@192:PRINT@192,"HOW MAN
Y MORE";:INPUTNC
780 PRINT:PRINT"PRINTER READY? P
RESS <ENTER>."
790 K$=INKEY$:IFK$<>CHR$(13)THEN
790ELSE360
800 PMODE0,1:PCLEAR1:GOTO30
```

VIP Writer III 2.0

495K Total Text Space • EASY 4 Color MENUS

> *"In the beginning there was **VIP Writer** and users saw that it was good, But it's not the best anymore. There's a new word processor to claim the crown...**VIP Writer III** –Setting the Standard"* **–RAINBOW Sept. 1988**

MORE SCREEN DISPLAY OPTIONS

VIP Writer III offers screen widths of 32, 40, 64 & 80 - all with 24 lines and actual lower case letters using the CoCo 3's hardware display. It runs at double clock speed and has 4-color menus making VIP Writer III FAST and EASY to use! You can choose foreground, background, hilite and cursor colors from up to 64 hues. Color can be turned ON or OFF for the best possible display using a monochrome monitor or TV set. VIP Writer III has a context sensitive help facility to display command usage in easy to read colored windows.

CUSTOMIZER & PRINTER INSTALLER

VIP Writer III comes with a configuration / printer installation program which lets you customize VIP Writer III to suit your own liking. You can set screen width and colors as well as margins and more. You can also install your own printer and set interface type (serial, parallel or J&M), baud rate, line feeds, etc. Once done, you never have to enter these parameters again! VIP Writer III will load n' go with your custom configuration every time!

MORE TOTAL TEXT STORAGE

VIP Writer III has 106K total text storage in a 128K CoCo 3 (495K in 512K). VIP Writer III creates ASCII text files which are compatible with all other VIP Programs as well as other programs which use ASCII files. You can use VIP Writer III to even type BASIC programs! There is a 48K text buffer (438K in a 512K CoCo 3) and disk file linking allowing virtually unlimited text space. VIP Writer III works with up to four disk drives and lets you display directories and free space as well as rename or kill disk files. In addition VIP Writer III is 100% compatible with the RGB Computer Systems Hard Disk.

POWERFUL EDITING FEATURES

VIP Writer III has a full featured screen editor which can be used to edit text with lines up to 240 characters long with or without automatic word wrap around. You can select type-over mode or insert mode. There is even an OOPS command to recall a cleared text buffer. Other editing features include: Type-ahead • typamatic key repeat and key beep for flawless text entry • end of line bell • full four way cursor control with scrolling • top of textfile • bottom of textfile • page up • page down • top of screen • bottom of screen • beginning of line • end of line • left one word • right one word • DELETE character, to beginning or end of line, word to the left or right, or entire line • INSERT character or line • LOCATE and/or CHANGE or DELETE single or multiple occurrence using wildcards • BLOCK copy, move or delete with up to TEN simultaneous block manipulations • TAB key and programmable tab stops • word count • line restore • three PROGRAMMABLE FUNCTIONS to perform tasks such as auto column creation and multiple copy printing.

Writer III or Library /W owners: Upgrade to the VIP Writer III 2.0 for $10 + $3 S/H. Send ORIGINAL disk and $13 total.

AUTOMATIC TEXT FORMATTING

VIP Writer III automatically formats your text for you or allows you to format your text in any way you wish. You can change the top, bottom, left or right margin and page length. You can set your text flush left, center or flush right. You can turn right hand justification on or off. You can have headers, footers, page numbers and TWO auxiliary lines which can appear on odd, even or all pages. You can also select the line on which they appear! You can even change the line spacing! Parameters can be altered ANYWHERE !

PREVIEW PRINT FORMAT WINDOW

VIP Writer III features an exclusive format window which allows you to preview your document BEFORE PRINTING IT! You are able to move up, down, left and right to see centered and justified text, margins, page breaks, broken paragraphs, orphan lines etc.

PRINTING VERSATILITY

VIP Writer III prints TWICE as fast as any other CoCo word processor! It supports most serial or parallel printers using J&M JFD-CP or Rainbow interface and gives you the ability to select baud rates from 110 to 19,200. You can imbed printer control codes anywhere in your text file EVEN WITHIN JUSTIFIED TEXT! VIP Writer III also has TWENTY programmable printer macros which allow you to easily control all of your printers capabilities such as bold, underline, italics and superscript using simple key strokes. Other features include: multiple copy printing • single sheet pause • line feeds.

BUILT IN PRINT SPOOLING

VIP Writer III has a print spooler with a 57,000 character buffer which allows you to print one document WHILE you are editing another. You don't have to wait until your printer is done before starting another job! Some word processors DO NOT include this feature!

50,000 WORD SPELLING CHECKER

VIP Writer III includes VIP Speller (not FREEWARE) to check your text for misspelled words It has a 50,000 (not 20,000) word dictionary that can be added to or edited.

QUALITY DOCUMENTATION

VIP Writer III comes with a well written 125 page manual which is Laser printed, not dot-matrix like the competition. It includes a tutorial, glossary of terms and examples for the beginner as well as a complete index! VIP Writer III is truly the BEST you can buy.

VIP Writer III includes VIP Speller 1.1. **DISK $79.95**

Available thru Radio Shack Express Order Cat. #900-0908

VIP Writer owners: Upgrade to the VIP Writer III 2.0 for $49.95 + $3 S/H. Send ORIGINAL disk and $52.95 total.

VIP Database III

DATABASE • MATH PACKAGE • MAILMERGE

VIP Database III features selectable screen displays of 40, 64 or 80 characters by 24 lines with choice of 64 foreground, background, hilite and cursor colors for EASY DATA ENTRY. It uses the CoCo 3's hardware screen and double clock speed to be the FASTEST database available! VIP Database III will handle as many records as will fit on your disks and is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. IN-MEMORY SORT of records is LIGHTNING FAST and provides for easy listing of names, figures, addresses, etc., in ascending or descending alphabetical or numeric order. Records can be searched for specific entries using multiple search criteria. The built-in mail-merge lets you sort and print mailing lists, print form letters, address envelopes - the list is endless. The built-in MATH PACKAGE even performs arithmetic operations and updates other fields. VIP Database III also has a print spooler and report generator which uses print forms you create. **DISK $69.95**

VIP Database owners: Upgrade to the VIP Database III for $39.95 + $3 S/H. Send ORIGINAL disk and $42.95 total.

VIP Library /WDCE

The VIP Library /WDCE combines all six popular VIP application programs - VIP Database III, VIP Writer III, VIP Speller, VIP Calc III, VIP Terminal and VIP Disk-ZAP - into one program on one disk! The program is called VIP Desktop. From the desktop you have instant access to word processing with a spelling checker always in attendance, data management with mail merge, spreadsheet financial analysis, telecommunications and disk maintenance. * **DISK $179.95**
For VIP Library shipping please add $4 USA. $5 Canada. $10 Foreign.

VIP Library owners: Upgrade to the VIP Library /WDCE for $99.95* + $3 S/H. Send ORIGINAL disk and $102.95 total.

* Future VIP Library upgrades available at reduced cost.

VIP Calc III

FAST 4 color POPUP menus • PRINT SPOOLER 32, 40, 64 and 80 Column HARDWARE display Runs VERY FAST at double clock speed!

Now every CoCo 3 owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. VIP Calc III allows a large worksheet with up to 512 columns by 1024 rows! In addition, VIP Calc III has up to 16 windows which allow you to compare and contrast results of changes. Other features include trig. functions • averaging • algebraic functions • column and row ascending and descending SORTS • locate formulas or titles in cells • block move and replicate • global or local column width • limitless programmable functions • works with ANY printer. Embed printer control codes for customized printing. Combine spreadsheet data with VIP Writer documents to create ledgers, projections, statistical and financial budgets and reports. **DISK $69.95**

VIP Calc owners: Upgrade to the VIP Calc III for $29.95 + $3 S/H. Send ORIGINAL disk and $32.95 total.

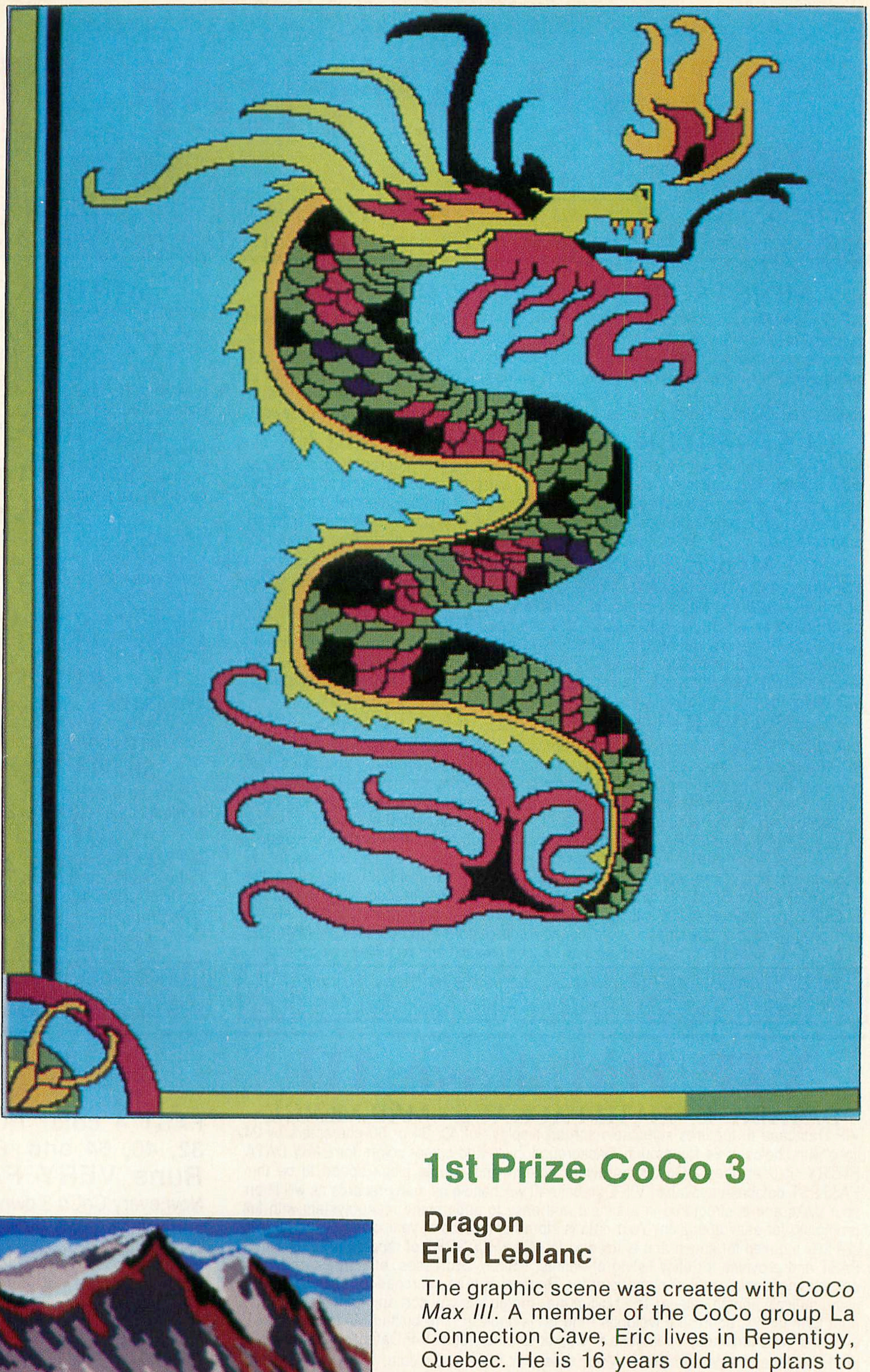
All products run under RSDOS and are not copy protected.

VISA® **SD Enterprises** MasterCard

✆(503) 663-2865 ✉POB 1233 Gresham, OR 97030

Non VIP Library orders add $3 for shipping and handling in USA. Canada $4. Foreign $6. COD orders add an additional $2.25. Checks allow 3 weeks for delivery. All other orders are shipped the same day.

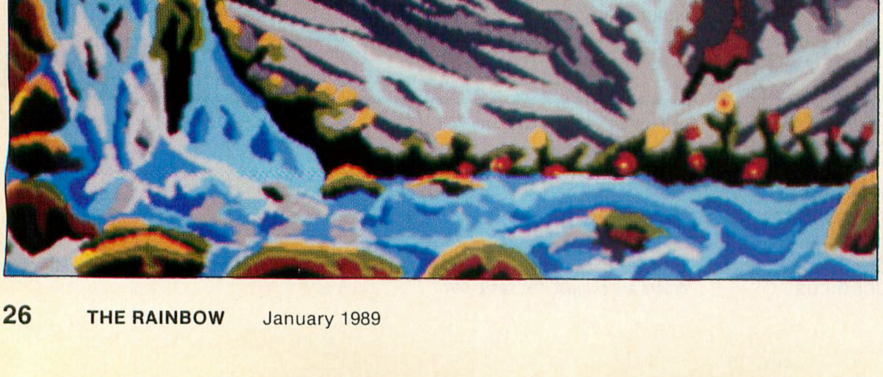
CoCo GALLERY



1st Prize CoCo 3

Dragon
Eric Leblanc

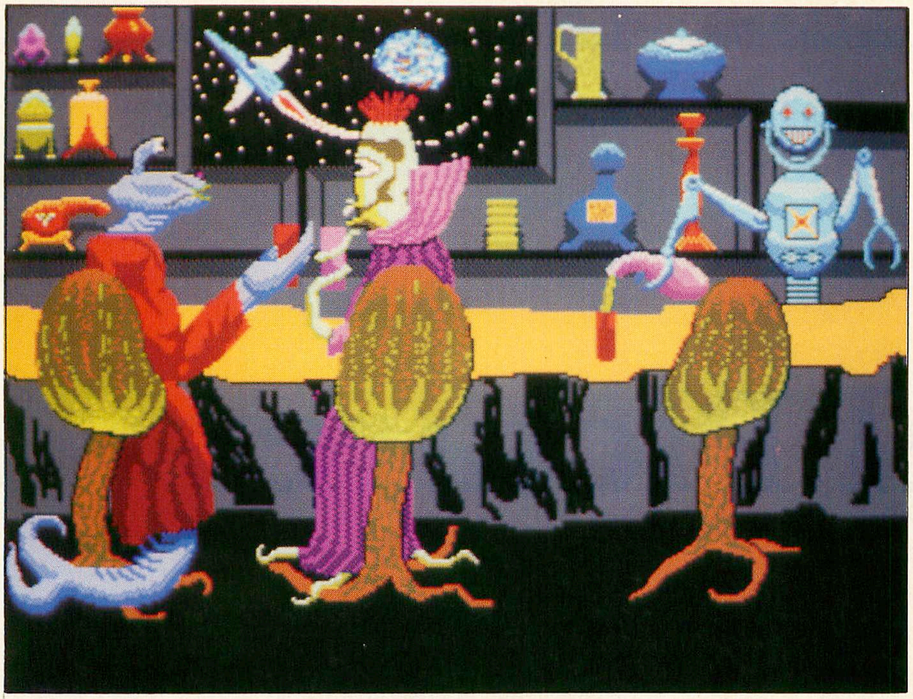
The graphic scene was created with *CoCo Max III*. A member of the CoCo group La Connection Cave, Eric lives in Repentigy, Quebec. He is 16 years old and plans to become a programmer.



3rd Prize

Mountain
Filipe Mateus

The impressionistic view of a mountain was created with *CoCo Max III*. Filipe, of St. Hubert, Quebec, studies computer science and loves to draw using his CoCo 3.



SHOWCASE YOUR BEST! You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community! Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

We will forward two first prizes of $25, one for the CoCo 3 and one for the CoCo 1 and 2; one second prize of $15 and one third prize of $10. Honorable Mentions may also be given.

Please send your entry on either tape or disk to the CoCo Gallery, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. Remember, this is a contest and your entry will not be returned.

— Tony Olive, Curator

2nd Prize

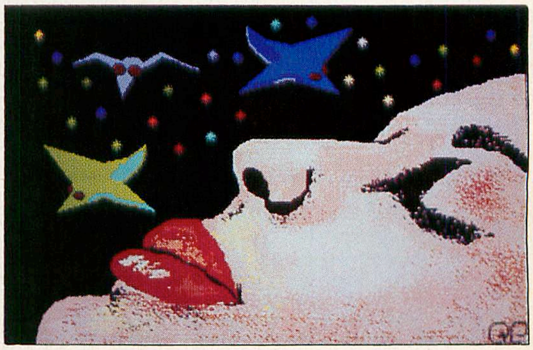
Space Tavern
Hal Katschke

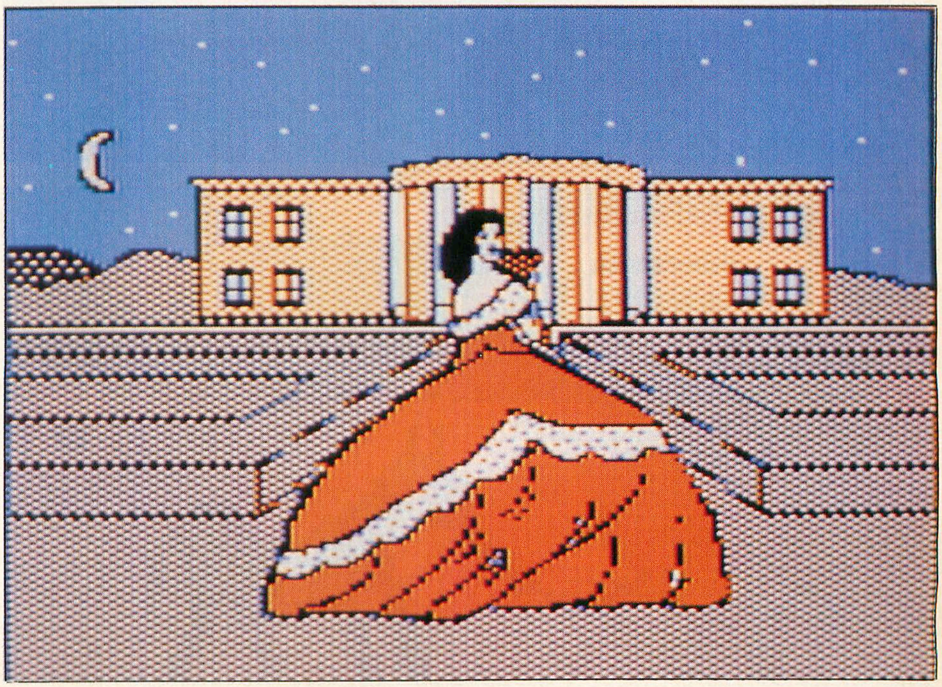
Hal produced this alien bar scene using *Color Max 3 Deluxe*. Hal resides in Frankfort, Illinois.

Honorable Mention

Dream State
Richard Perreault

Is this a dream or a nightmare? Richard uses *Color Max 3* and enjoys refining the detail in his art. He is 21, lives in Boucherville, Quebec, and presently works for a telecommunications firm.





1st Prize CoCo 1 & 2

Southern Belle
Troy Graham

Troy is sixteen years old. He produced this picture on a CoCo 2 using *CoCo Max II*. Troy lives in Arnold, Maryland.

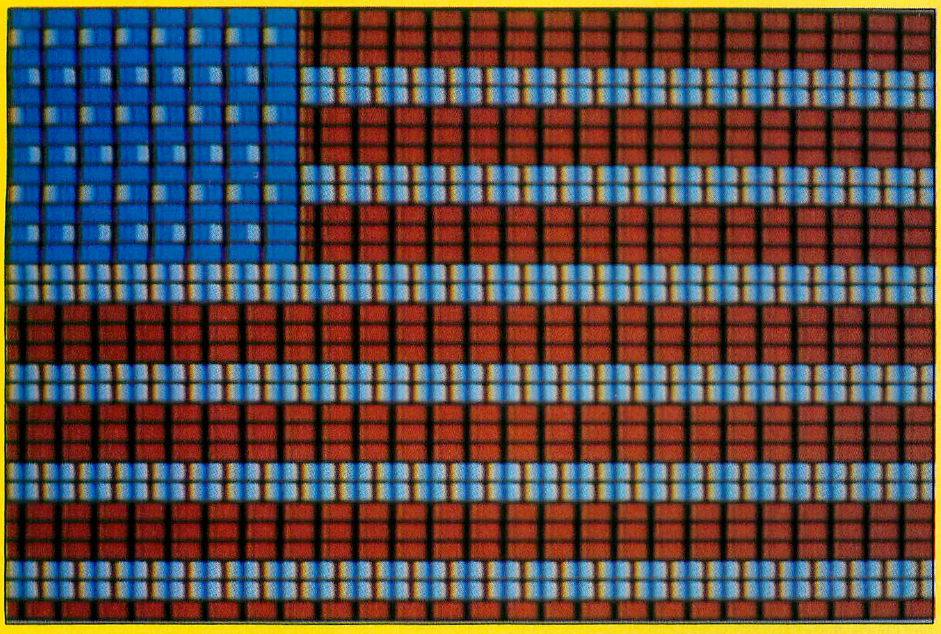
Feature

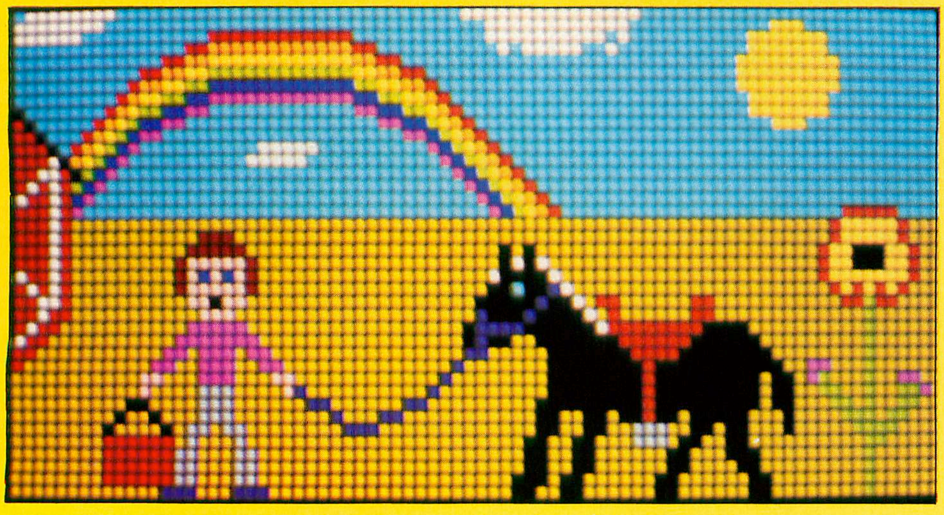
16K Disk CoCo 3

Use these graphics programs to create brilliant pictures

Pixel Pictures

By Bill Bernico





A few years ago, there was a toy on the market that let a person insert tiny colored bulbs into a lighted grid. The bulbs were placed in the grid to form a picture or design. As they were inserted, the bulbs lit up. My program, *Building Blocks*, uses your computer screen to simulate that idea.

There are two versions of the program: `BLOCK3` for the CoCo 3 and `BLOCK2` for the CoCo 1 and 2. The main differences between the two versions are the available colors and the size of the squares. The CoCo 3 versions are the available colors and the size of the squares. The CoCo 3 version allows 16 colors and has a grid with four-by-four-pixel squares. The red and blue colors are *artificated.* In other words, I had to use `POKE 178, 1` for red and `POKE 178, 2` for blue. Granted, the colors for the CoCo2 are limited, but you can still produce some nice pictures.

Program operation is simple. The screen is filled with tiny squares, each four-by-four pixels on the CoCo 3 and each five-by-five pixels on the CoCo 1 and 2. There are over one thousand of these squares on the screen. Move to any of these squares using the arrow keys. If you move off the left side of the screen, you'll reappear on the right and vice versa. The same wrap-around

---

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.

Telewriter-128™

the Color Computer 3 Word Processor

TELEWRITER: UNDISPUTED #1

If you've read the other word processor ads, you've probably had your fill of cold lists of features, and claims of ultimate speed, power, and ease of use. So let's try to get past the overblown claims and empty buzz words—with 2 simple facts:

Fact 1: Telewriter is undisputedly the #1 most popular word processor on the Tandy Color Computers.

Fact 2: Telewriter's exemplary ease of use and power have been acclaimed in numerous magazine reviews and in thousands of letters and calls from end users.

THE OTHERS DON'T UNDERSTAND

So why has Telewriter gained such a large and loyal following, while other Color Computer word processors have come and gone? Ironically, our competitors' ads tell you *exactly* why.

For them, word processing is nothing more than features and numbers. The longer the list of features, and the bigger the numbers, the better the word processor. Or so they think.

They just don't understand that power and ease of use are not gained by tacking on random features or throwing in freebie utilities or forcing you to use a cumbersome mouse.

Real Power, *true* Ease of Use, and *genuine* Speed can only be attained through thoughtful, logical, intelligent design, attention to detail, and a commitment to the act and the art of writing. That's the Telewriter tradition, and that's the reason for Telewriter's phenomenal success.

TELEWRITER—128: INTELLIGENT DESIGN PERFECTED

And now, Telewriter-128, the latest Telewriter, uses the added hardware power of the Color Computer 3 to bring this intelligent design to its logical perfection.

Telewriter-128 adds unsurpassed speed and important new features to the already impressive arsenal of Telewriter-64. Not just speed for speed's sake, or features for the sake of advertising—but speed where it counts and features that make you a more efficient, more effective writer.

Rainbow magazine put it this way: "Telewriter-128 will set the word processing standard for the Color Computer 3 because it is so simple and user friendly. . . . The 81-page tutorial/user's manual is nicely done. It is written in easy to understand language but the program itself is so easy. . . . Most people will be able to use the software right out of the package."

TELEWRITER-128 OR DESKTOP PUBLISHING

Desktop publishing is nice for adding pictures and fancy fonts to newsletters or business presentations—but its graphics orientation sacrifices some important capabilities when it comes to working with words.

If your main concern is expressing ideas through words (notes, letters, reports, papers, novels, etc.), the dedicated word processing power of Telewriter-128 still provides the most efficient tool for the job. Each tool has its place—desktop publishing for striking visuals, Telewriter-128, for effective writing.

TELEWRITER-128 OR TELEWRITER-64

You can no longer afford to be without the ease, power, and efficiency, that Telewriter brings to everything you write.

Telewriter-128 for the Color Computer 3 costs $79.95 on disk, $69.95 on cassette.

For the Color Computer 1&2, **Telewriter-64** costs $59.95 on disk, $49.95 on cassette.

To order by MasterCard or Visa,
call **(619) 755-1258** anytime, or send check to:

COGNITEC
704 Nob Avenue
Del Mar, CA 92014

(Add $2 S&H. Californians add 6% tax. To upgrade from TW-64 to TW-128 send original TW-64 disk and $41.95.)

Telewriter is also available through your nearby Radio Shack Computer Center and participating Radio Shack stores and dealers—or order direct from Express Order by dialing **1-800-321-3133.**

Ask for: **Telewriter-128** (disk) . . . cat #90-0909
Telewriter-64 (disk) . . . . cat #90-0254
Telewriter-64 (cass) . . . . cat #90-0253

FEATURES THAT MATTER: Telewriter's outstanding design and its complete set of features, put it in a class by itself, for smooth, efficient writing and letter perfect printed documents. Telewriter-128 includes:

Unbeatable SCREEN PERFORMANCE: lightning fast paging and scrolling, on-screen text that never lags behind your typing, and a response that is always instantaneous, no matter how much text is in the buffer, or where you are in the document.

26 User definable MACRO KEYS type your often used phrases and titles with a single keypress—saving you time and freeing your concentration for writing. User settable DUAL SPEED CURSOR moves you anywhere on the line, on the page, or in the document, fast or slow—you decide, with the touch of a finger. Fast PRINT PREVIEW MODE shows you text as it will print: headers, footers, margins, page breaks, page numbers, justification—saves time and paper and guarantees perfect looking documents everytime.

Instant, ON-LINE HELP summarizes all Telewriter-128 commands and special symbols. The On-line OPTIONS MENU lets you instantly customize the writing environment at any time to suit your precise needs (Screen/character color, Monochrome on/off, Key repeat/delay rate, 2 Cursor repeat/delay rates, Case-sensitivity of search, Auto file backup on/off, and more). A SINGLE FUNCTION KEY takes you instantly to any menu, so you never have to stop and think.

The 24, 25 or 28 LINE SCREEN DISPLAY option lets you see 16% more on-screen text (28), or wider line spacing (25). The auto-loading OPTIONS FILE stores all your Macros, Print Format settings, and Options Menu settings, so they are always there everytime you run Telewriter-128. 3 pop-up STATUS WINDOWS tell you cursor position, word count, free space, etc.

The QUICK SAVE feature lets you instantly save your current document with just 2 keystrokes and without leaving the editor. CURSOR THROUGH DIRECTORY to Load, Append, Rename and Kill files—so you'll never type a filename after the first time. HANGING INDENTS help you organize ideas on the page more effectively. Also: Footers, Multiple Print, Print to Disk, Key Click, Key Repeat, 40/80 Column Option, Overstrike, Word Delete, Nested Macros, Definable Foreign and Math Symbols and more. . . .

And, of course, Telewriter-128 incorporates all the Features of TELEWRITER-64, like: Works with *absolutely any printer* that works with your Color Computer (1, 2, or 3). Uses simple Embedded Control Codes so *all* intelligent features of your printer are easily accessed, including: Underlining, Boldface, variable Fonts, Sub-script, Super-script, Italics etc.

Format commands allow dynamically changing Margins, Headers, Spacing, Centering, etc., anywhere in the document. Format menu sets Margins, Spacing, Page numbering, Baud rate, Lines per page, Justification. Chain Printing means the size of your printed document is unlimited. Also Single page and Partial Print.

Fast full-screen editor with wordwrap, text alignment, block copy/move/delete, global search and replace, wild card search, fast 4-way auto-repeat cursor, fast scrolling, forward and backward paging, settable tabs, word and line counter, full error protection. Insert or delete anywhere on screen. Simple, easy to remember, "mnemonic" Editor Commands. Load, Save, Append, Partial Save files to disk or cassette. Kill, rename and list disk files. ASCII file compatibility.

feature applies to top and bottom movement, too.

Once you've moved to the square of your choice, you can paint it any of sixteen colors on the CoCo 3 and four colors on the CoCo 1 and 2. Painting enough of these squares will produce a picture or design. On the CoCo 3 you paint by pressing the number keys (0 through 9) *and* the first six keys of the bottom row (Z through N). Keys zero through eight will give you the standard color values: 0 is green, 1 is yellow, 2 is blue,etc. I've assigned gray as Key 9's color value. I've also selected custom colors for keys Z through N. You can change these by substituting different values in the `PALETTE` statements. On the CoCo 1 and 2, painting is done by pressing 1 for red, 2 for blue and 3 for black. To obtain a white square, simply leave it unpainted.

Even when a square has been painted, you can paint over it by pressing a new color key. There is no need to erase that square first and repaint. The only exception to this rule is when a square is painted black. Then you'll have to press E to erase the black before you can paint the block another color.

The other command keys are Q to quit and R to restart. Quit means just that — you'll exit the program by selecting Q. Pressing R will wipe the screen clean and give you a chance to start over with a new creation. If you press either of these keys, you'll be asked if you're sure you want to select that key, so that you won't accidentally destroy a lot of work. Simply press Y for yes or N for no.

Pressing E will erase only the square that the cursor is on at the time. Pressing S will save your picture to disk, and L will load a picture from disk. These two options also have a safety feature built in. If you accidentally press S, L, Q or R you'll get a chance to verify (by pressing Y for yes or N for no) whether or not you're ready for that step. You wouldn't want to lose a lot of work before you're done.

RAINBOW ON DISK subscribers can load either of the two sample picture files provided. When you press L, you'll be asked for a filename. There is no need to enter the extension. `SAMPLE1` is the sample file for `BLOCKS3` while `SAMPLE2` works with `BLOCKS2`.

The keys to *Building Blocks* are patience and a little artistic talent. I have the former, but lack the latter (as you can probably tell by the sample picture). If an untalented artist like me can create colorful pictures, imagine what you can do. Anyone who wants to send me a copy of the pictures he or she creates with this program is welcome to do so. I'd love to see what you can do.

(Questions or comments about these programs can be directed to the author at 708 Michigan Ave., Sheboygan, WI 53081. Please include an SASE when requesting a reply.) ☐

Listing 1: `BLOCKS3`

```
10 'BUILDING BLOCKS 3 (C)1988
    FROM BILL BERNICO SOFTWARE

    GRAPHICS SAVE/LOAD ROUTINE
    COURTESY OF LARRY BOELDT

    LOADS FILES WITH /BB3 EXT

20 RGB:A$="U4R4D4L4":H=0:V=4:HSC
REEN2:HCLS4:HCOLOR8,4:ONBRKGOTO3
30
30 PALETTE7,52:PALETTE9,56:PALET
TE10,32:PALETTE11,20:PALETTE12,4
0:PALETTE13,12:PALETTE14,60:PALE
TTE15,48:POKE&HE6,2:POKE&HE6C6,1
8:POKE&HE6C7,18
40 GOSUB480:GOSUB490
70 HDRAW"BM=H;,=V;C4"+A$:HDRAW"B
M=H;,=V;C8"+A$
80 I$=INKEY$
90 IF I$=CHR$(8)THEN H=H-4
100 IF H<0 THEN H=312
110 IF I$=CHR$(9)THEN H=H+4
120 IF H>312 THEN H=0
130 IF I$=CHR$(10)THEN V=V+4
140 IF V>156 THEN V=4
150 IF I$=CHR$(94)THEN V=V-4
160 IF V<4 THEN V=156
170 IF I$="Z"THEN HPAINT(H+2,V-2
),10,8
180 IF I$="X"THEN HPAINT(H+2,V-2
),11,8
190 IF I$="C"THEN HPAINT(H+2,V-2
),12,8
200 IF I$="V"THEN HPAINT(H+2,V-2
),13,8
210 IF I$="B"THEN HPAINT(H+2,V-2
),14,8
220 IF I$="N"THEN HPAINT(H+2,V-2
),15,8
230 IFI$>"/"AND I$<":"THEN P=VAL
(I$):HPAINT(H+2,V-2),P,8
240 IF I$="E"THEN 320
250 IF I$="R"THEN HCOLOR8:HPRINT
(23,23),"Hit R to restart":HCOLO
R9:HPRINT(23,23),"RESTART?? (Y/N
)":FORX=1TO9:SOUND191,1:NEXT
260 IF I$="R"THENX$=INKEY$:IFX$=
"Y"THEN20ELSEIFX$="N"THENHCOLOR8
:HPRINT(23,23),"RESTART?? (Y/N)"
:GOTO60ELSE260
270 IF I$="Q"THEN HCOLOR8:HPRINT
(23,21),"Hit Q to quit":HCOLOR9:
HPRINT(23,21),"QUIT?? (Y/N)":FOR
X=1TO9:SOUND191,1:NEXT
280 IF I$="Q"THENX$=INKEY$:IFX$=
"Y"THEN330ELSEIFX$="N"THENHCOLOR
8:HPRINT(23,21),"QUIT?? (Y/N)":G
OTO60ELSE280
290 IF I$="S"THEN WIDTH40:GOTO34
0

300 IF I$="L"THEN WIDTH40:GOTO42
0
310 GOTO 70
320 HLINE(H,V)-(H+4,V-4),PRESET,
BF:HDRAW"BM=H;,=V;C4"+A$:HDRAW"B
M=H;,=V;C8"+A$:GOTO 80
```

```
330 POKE65496,0:WIDTH32:CLS:RGB:
END
340 INPUT "NAME";N$
350 HSCREEN2
360 POKE65497,0
370 PT=3584:FOR Y=2 TO 158 STEP
4
380 FORX=2 TO 318 STEP 4
390 Z=HPOINT(X,Y):POKE PT,Z:PT=P
T+1
400 NEXTX,Y:POKE65496,0:SAVEM N$
+".BB3",3584,6784,44537
410 GOTO 80
420 INPUT"NAME";N$:LOADM N$+".BB
3":PT=3584
430 HSCREEN2:POKE65497,0:HLINE(0
,0)-(315,156),PRESET,BF:GOSUB480
440 FOR Y=2 TO 158 STEP 4
450 FOR X=2 TO 318 STEP 4
460 HPAINT(X,Y),PEEK(PT),8:PT=PT
+1:NEXT X,Y:POKE65496,0
470 GOTO80
480 FORX=0TO156STEP4:HLINE(0,X)-
(315,X),PSET:NEXTX:FORX=0TO316ST
EP4:HLINE(X,0)-(X,156),PSET:NEXT
X:RETURN
490 HPAINT(318,1),8,8:HCOLOR0:HP
RINT(0,20),"Hit L to load":HCOLO
R6:HPRINT(23,20),"Hit S to save"
:HCOLOR2:HPRINT(0,21),"Move with
 arrow keys":HCOLOR1:HPRINT(0,22
),"Paint with keys (0-8)":HPRINT
(0,23),"OR row one (keys Z-N)"
500 HCOLOR3:HPRINT(23,21),"Hit Q
 to quit":HCOLOR4:HPRINT(23,22),
"Hit E to erase":HCOLOR5:HPRINT(
23,23),"Hit R to restart":RETURN
```

120	145
290	0
410	109
620	95
800	32
END	224

Listing 2: BLOCKS2

```
10 'BUILDING BLOCKS (FOR COCO 2)
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```

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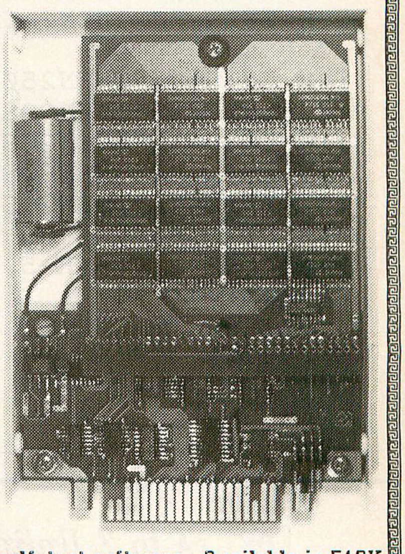

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```
20 B$="U5R5D5L5":H=0:V=5:PMODE4,
1:SCREEN1,1:PCLS1:COLOR0,1:GOSUB
410
30 FORX=0TO155STEP5:LINE(0,X)-(2
55,X),PSET:NEXTX:FORX=0TO255STEP
5:LINE(X,0)-(X,155),PSET:NEXTX
40 DRAW"BM1,158":A$="L=LOAD":GOS
UB1010:DRAW"BM1,170":A$="S=SAVE"
:GOSUB1010:DRAW"BM1,182":A$="Q=Q
UIT":GOSUB1010:DRAW"BM70,158":A$
="R=RESTART":GOSUB1010:DRAW"BM70
,170":A$="E=ERASE":GOSUB1010:DRA
W"BM65,191NH2NE2U10NG2NF2D5L7NE2
NF2R14NH2NG2L5C1L4R2UD2C0
50 DRAW"BM78,182":A$="=MOVE CURS
OR":GOSUB1010:DRAW"BM195,158":A$
="1=RED":GOSUB1010:DRAW"BM195,17
0":A$="2=BLUE":GOSUB1010:DRAW"BM
195,182":A$="3=BLACK":GOSUB1010
60 DRAW"BM=H;,=V;C1"+B$:DRAW"BM=
H;,=V;C0"+B$
70 I$=INKEY$
80 IF I$=CHR$(8)THEN H=H-5
90 IF H<0 THEN H=250
100 IF I$=CHR$(9)THEN H=H+5
110 IF H>250 THEN H=0
120 IF I$=CHR$(10)THEN V=V+5
130 IF V>155 THEN V=5
140 IF I$=CHR$(94)THEN V=V-5
150 IF V<5 THEN V=155
160 IFI$="1"THENPOKE178,1:PAINT(
H+2,V-2),,0:POKE178,0
170 IFI$="2"THENPOKE178,2:PAINT(
H+2,V-2),,0:POKE178,0
180 IFI$="3"THENPAINT(H+2,V-2),0
,0
190 IFI$="E"THEN250
200 IFI$="R"THENGOSUB370:GOTO380
210 IFI$="Q"THENGOSUB370:GOTO340
220 IFI$="S"THENGOSUB370:GOTO260
230 IFI$="L"THENGOSUB370:GOTO300
240 GOTO 60
250 LINE(H,V)-(H+5,V-5),PRESET,B
F:DRAW"BM=H;,=V;C1"+B$:DRAW"BM=H
;,=V;C0"+B$:GOTO70
260 LINE(0,169)-(53,180),PSET,BF
:DRAW"BM3,170C1":A$="SAVE ?":GOS
UB1010
270 S$=INKEY$:IFS$="Y"THEN290ELS
EIFS$="N"THEN280ELSE270
280 LINE(0,169)-(53,180),PRESET,
BF:DRAW"BM1,170C0":A$="S=SAVE":G
OSUB1010:GOTO70
290 LINE(0,169)-(53,180),PRESET,
BF:DRAW"BM1,170C0":A$="S=SAVE":G
OSUB1010:CLS:INPUT"FILENAME";N$:
SCREEN1,1:SAVEMN$,3584,9727,3584
:GOTO70
300 LINE(0,157)-(53,168),PSET,BF
:DRAW"BM3,158C1":A$="LOAD ?":GOS
UB1010
310 L$=INKEY$:IFL$="Y"THEN330ELS
EIFL$="N"THEN320ELSE310
320 LINE(0,157)-(53,168),PRESET,
BF:DRAW"BM1,158C0":A$="L=LOAD":G
OSUB1010:GOTO70
330 CLS:INPUT"FILENAME";N$:SCREE
N1,1:LOADMN$:GOTO70
340 LINE(0,180)-(53,191),PSET,BF
:DRAW"BM4,181C1":A$="QUIT ?":GOS
UB1010
350 Q$=INKEY$:IFQ$="Y"THENCLS:EN
DELSEIFQ$="N"THEN360ELSE350
360 LINE(0,180)-(53,191),PRESET,
BF:DRAW"BM2,182C0":A$="Q=QUIT":G
OSUB1010:GOTO70
370 PLAY"O5T60BCBCBCBCBCBCB":RET
URN
380 LINE(68,157)-(150,168),PSET,
BF:DRAW"BM70,158C1":A$="RESTART
?":GOSUB1010
390 Q$=INKEY$:IFQ$="Y"THENRUNELS
EIFQ$="N"THEN400ELSE390
400 LINE(68,157)-(150,168),PRESE
T,BF:DRAW"BM70,158C0":A$="R=REST
ART":GOSUB1010:GOTO70
410 DIMA$(90):A$(32)="BR6
420 A$(33)="D5BD3NDBU8BR4
430 A$(34)="DBR2UBR4
440 A$(35)="BD3R7BD3L7R2D2U7BR3D
7BU8BR6
450 A$(36)="BR3D9UL2NHR4EUH2L2H2
ER4FBU2BR4
460 A$(37)="NR2D2R2UBR3G6BR3DR2U
2L2BU6BR6
470 A$(38)="BR4LGDFDLG2DFR2ERNFU
NEH2E2UHBR6
480 A$(39)="DEBR4
490 A$(40)="BR2G2D4F2BU8BR4
500 A$(41)="F2D4G2BU8BR6
510 A$(42)="BD2F3NF3NG3NL3NR3E3B
U2BR6
520 A$(43)="BD2D6U3L3R6BU5BR4
530 A$(44)="BD7RGRDGBU10BR5
```

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```
540 A$(45)="BD5R6BU5BR4
550 A$(46)="BD7RGRBU8BR4
560 A$(47)="BR6DG6DBU8BR10
570 A$(48)="BRNR4GD6NE6FR4EU6BUB
R3
580 A$(49)="BR2BD2E2D8L2R4BU8BR3
590 A$(50)="BDER4FDG6R6BU8BR3
600 A$(51)="BDER4FD2GNL2FD2GL4HB
U7BR9
610 A$(52)="BD5NR6E5ND8BR4
620 A$(53)="BD7FR4EU2HL5U4R6BR3
630 A$(54)="BD4R5FD2GL4HU6ER4NFB
R3
640 A$(55)="BD8BRUE5U2NL6BR3
650 A$(56)="BRNR4GD2FNR4GD2FR4EU
2HEU2HBR4
660 A$(57)="BD7FR4EU6D3L5HU2ER4B
R4
670 A$(58)="BD3RGRBD2LDRBU7BR3
680 A$(59)="BD3RGRBD2LDRDGBU9BR4
690 A$(60)="BR4G4F4BU8BR3
700 A$(61)="BD2NR6BD2R6BU4BR3
710 A$(62)="F4G4BU8BR7
720 A$(63)="BDER4FDG3BD2NDBU7BR6
730 A$(64)="BD2D6FR4EU2HL2GDFBU7
L2R4NFBR4
740 A$(65)="BR3G3DND4R6D4U5H3BR6
750 A$(66)="R5FD2GNL4FD2GL5RU8BR
8
760 A$(67)="BR5NFL4GD6FR4EBU7BR3
770 A$(68)="RD8LR5EU6HL4BR8
780 A$(69)="D8NR6U4NR5U4R6BR3
790 A$(70)="D8U4NR5U4R6BR3
800 A$(71)="BR5NFL4GD6FR4EU2L2BU
5BR5
810 A$(72)="D8U4R6D4U8BR3
820 A$(73)="R2D8L2R4L2U8R2BR3
830 A$(74)="BR2R4L2D7GL2HBU7BR9
840 A$(75)="D8U4R2NF4E4BR3
850 A$(76)="D8R6BU8BR3
860 A$(77)="ND8F3E3ND8BR3
870 A$(78)="ND8DF6DU8BR3
880 A$(79)="BR5L4GD6FR4EU6HBR4
890 A$(80)="NR5D8U4R5EU2HBR4
900 A$(81)="BR5L4GD6FR3EF2H4F2EU
5HBR4
910 A$(82)="NR5D8U4R2NF4R3EU2HBR
4
920 A$(83)="BR5NFL4GD2FR4FD2GL4H
BU7BR9
930 A$(84)="R6L3ND8BR6
940 A$(85)="D7FR4EU7BR3
950 A$(86)="D5F3E3U5BR3
960 A$(87)="D8E3F3U8BR3
970 A$(88)="DF6NDH3G3NDE6UBR3
980 A$(89)="D2F3ND3E3U2BR3
990 A$(90)="R6DG6DR6BU8BR3
1000 RETURN
1010 FORX=1TOLEN(A$):Y=ASC(MID$(
A$,X,1)):DRAWA$(Y):NEXT:RETURN
```

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1) Learn OS9
2) Buy a Hard Disk
3) Clean Garage

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The club that plays together stays together

CoCo Clubs: Building A Great Foundation

By Ed Hathaway

I can still remember the day my wife and I bought our first CoCo. Just before Christmas of 1980, a Radio Shack television advertisement convinced us that our household wasn't complete without this new, *affordable* home computer. Although neither one of us had any experience with a computer, $500 seemed like a good deal for a 16K non-extended something-or-another gray box called a TRS-80 Color Computer. Soon after our pilgrimage to Radio Shack, we had our CoCo playing "Jingle Bells" and were trying to figure out what a `CLOAD` did.

I sometimes wonder how we survived that first year of CoCo ownership. Every attempt to purchase software was an adventure in perseverance and consumer ignorance. It did not take us long to realize system support meant reading the manual or creating our own means of support. We chose to create our own form of CoCo support group.

By this time I had met two other CoCo owners who, like me, were wandering aimlessly about the Radio Shack Color Computer shelves. All three of us had some experience working with and belonging to local civic groups, and we all needed some help in learning about our CoCos and finding the best software for our beloved home computers. Glenside Color Computer Club was born.

Why Start a Club?

We CoCo users are in a difficult situation. Most new users are new to computing, and often our knowledge of computers is limited. Although many of us are complete novices, we are thrown into a world of upgrades, software and technical jargon. How can we find the best software and learn more about programming our computers without some form of support?

Most of us first turn to our Radio Shack personnel. (After all, these people helped us choose our CoCos. Shouldn't they help us gain computing experience?) Unfortunately, most of us learned that our Radio Shack personnel could not help us with many of our problems. They were not hired to teach us; they were hired to sell. We CoCoists must make our own purchasing decisions and we must learn about our computers through the manual and through experience.

Learning about our computers can be a lonely process. We learn through trial and error, and often we must guess when choosing the right software for our needs. Even brave CoCo users may choose not to upgrade or use their CoCos for more than a few "safe" applications — the struggle isn't worth it. However, by forming support groups, we can avoid many computing worries without limiting ourselves or our computers.

There are several forms of support available to Color Computer users. You already know about one of them because you're reading THE RAINBOW. This magazine offers all CoCo users program reviews and helpful articles that can eliminate our concerns and help us make intelligent software purchases. No matter how good the magazine, however, many of us need personal contact with other CoCo users. That is where a Color Computer club can help.

Is There Anybody Out There?

A CoCo Club gives users a chance to meet others who share the same interest — Color Computers. The club offers novices a chance to learn and experienced users a chance to help newcomers, swap stories, and learn something as well.

A CoCo Club is more than just a rap session, however. The club can offer other CoCoists a chance to test new software, and to see evaluations and demonstrations of new products. It can be a reference library, housing any or all publications about the Color Computer. The club can also let CoCo users join together for special projects that can be both fun and profitable. Finally, the CoCo Club unites a group of consumers who are sometimes ignored by the computer market.

Starting a Club

Last January, Mark Haverstock wrote an excellent article about starting a CoCo Club ("The Care and Feeding of a CoCo Club," Page 67, RAINBOW). His article covers the clubs basics — membership, meetings, newsletters, etc. Anyone interested in starting a club would benefit from reading his article. However, I would like to offer a few tips on starting a CoCo Club here.

First, you need to know what a CoCo Club does. Although reading my suggestions and considering your own needs will help, one of the best ways to understand what CoCoists expect from a club is to visit an established club. Such visits will help you decide how you want (and don't want) your club to run. (See Page 40 of this issue for a list of active CoCo Clubs in your area.)

You will need to decide what you and your members want from the club. Such goals will need to be considered while you plan your club's activities and meeting format. A Color Computer Club's main function is to gain product support for the CoCo. Our club's main goals were to lend new users support and to address the problems involved in purchasing hardware and software for our computers. To do this, we needed to be recognized by the community; we needed to promote our club and increase our membership.

Although you can start a club with just a few friends, the benefits of a CoCo Club are most noticeable when your club grows beyond those first few members. In order to gain members, you will need to promote your club. At first, this can be limited to word of

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Ed Hathaway is the current president and a founder of Glenside Color Computer Club of Illinois. He has just started his own publishing company, SCS Publishing, and is a partner in Second City Software. He lives in Chicago with wife, Ruth, and son, Scott.

mouth and possibly a flier posted at your local Radio Shack store. However, to *really* get things going, you need to send advertisements announcing your club to magazines like THE RAINBOW. Distribute your newsletter and let would-be club members see the benefits of such a support group in action. In addition, get a local BBS involved in the recruiting. Both you and the BBS SysOp can benefit from such a union. (For a list of local BBSs, see "BBS Listings" November '88, Page 106.)

> ***"If you are currently without a CoCo Club in your community, there is no better time than the present to get one going.***

Next you need to decide what format your meetings should use. Club meetings should include question and answer sessions, product presentations and time to socialize. Members will come to meetings and guests will join if you include these three things in your meetings. Opening up the meeting with a question and answer (or announcement) session provides time for an informative exchange and will break the ice for your presentations. Product presentations are the lifeblood of any computer club. Vary your schedule of presentations so that each meeting covers a different subject. Additionally, always allow for socializing at the close of the meeting. More problems are resolved during this contact time than at any other time.

You will also need to include guidelines for appropriate behavior, membership dues, election of club officials. All these policies should be stated in your club's bylaws.

Play by the Rules

When we were doing our Chicago RAINBOWfest seminar, the most requested piece of information was a hard copy of our club's bylaws. While setting up and running a CoCo Club was not a problem for most in attendance, generating bylaws seemed to be a major

Bylaws for the Glenside Color Computer Club

Objective: The Glenside Color Computer Club of Illinois is a not-for-profit computer club established to assist its members in learning and to better understand Tandy's Color Computer.

1. Meetings:

A. Meetings shall be held on the second Thursday of each month.

B. Meetings shall be held at a public establishment unless otherwise announced 30 days in advance of said meeting.

C. Meeting time will be between the evening hours of 7:30 to 9:30. Start and ending times may vary at the discretion of the President and/or the Board of Directors.

D. Subject matter covered during meetings will be decided by the President and/or the Board of Directors.

E. Board of Directors meetings shall and can be called on an *as needed* basis, providing a majority can be assembled. No actions shall be taken without receiving a majority vote and/or receiving majority support of attending Directors.

2. Membership Dues:

A. Membership dues must be paid upon filing an application form.

B. Membership dues will be decided upon by the elected officers at a board meeting and will remain in effect for no less then 12 months. At that time, an increase and/or decrease in the annual dues may be requested by the Board of Directors.

C. At no time shall the membership dues be increased and/or decreased without a 30-day written notice to the currect membership.

D. At no time shall the membership dues be increased and/or decreased without receiving a majority approval vote by the membership in attendance of a previously-announced meeting, providing Sections 2B and 2C of Club Bylaws have been followed.

E. To continue membership, dues must be paid annually on or about the time of filing original application form.

F. Notice to renew membership shall be issued by the Club Secretary and/or Treasurer no less than 30 days in advance of member's anniversary date.

G. Failing to renew annual membership dues will forfeit said member from receiving any and all Club benefits and/or services. Members shall be granted 60 days after receiving dues notice to arrange for payment before being released as a member in good standing.

3. Elected Officers:

A. Elected officers and Board of Directors are as follows:
President (1), Vice President (2), Vice President-Telecommunication* and Treasurer/Secretary (1)

*The Vice President-Telecommunication position is a position appointed by the President. Appointments will be granted to members who maintain a Club BBS. Said appointments must be approved by the Board of Directors.

B. Elections shall take place each year in or about the month of September.

C. Members seeking elected office may do so providing they are nominated by two other members in attendance on election night.

D. Elected officers shall remain in office for a term no less than one year.

E. If an elected officer is unable to complete his/her term, a replacement shall be appointed by the Board of Directors. Said appointment will assume set duties until the next election is held.

F. Elected officers may choose to succeed themselves providing a majority vote is given by the attending members on election night.

G. In the event that the President is unable to complete said term, the Board of Directors will appoint a replacement from their ranks. This appointment must be voted on by the attending members at the next available monthly meeting.

H. Elected officers can and shall be asked to step down from their positions if so requested by the Board of Directors. In order for said action to take place, it must be clearly shown that the officer is unable or incapable of performing the duties of that office.

4. Communications:

A. A monthly notice, newsletter and/or publication will be mailed to the membership announcing time, date and location of each meeting.

B. Cost for said mailing will be paid from Club funds.

C. An annual fee can be charged to non-members who wish to receive a copy of the Club's monthly notice, newsletter and/or publication. Said fee shall not exceed $2 more than the annual membership dues rate set from Section 2. Other arrangements and fees can be made with the approval of the Board of Directors regarding said notice, newsletter and/or publication.

D. There will be only one (1) official Club notice, newsletter and/or publication authorized. Any other such notice, newsletter and/or publication using the name *Glenside* that is provided to the active members of the Glenside Color Computer Club of Illinois shall be deemed an unauthorized notice, newsletter and/or publication.

E. An authorized Club BBS may be established by its membership providing the following rules be met:

1. The name of said BBS must include the word *Glenside* at the log-in screen.
2. Meeting announcements and other Club activities must be posted for all callers to read after establishing their names and/or passwords.
3. At no time will the BBS or its operator provide for or use said BBS to distribute any copyrighted material whatsoever.
4. If it is found that said BBS is providing and/or distributing copyrighted material, that system shall be dropped as an authorized Club BBS. In addition, the system operator will lose the appointed Vice President position. A notice of such action will be mailed to all current members, selected Color Computer vendors and supported publications.

F. The system operator can charge an additional user fee to Club members and non-members providing said fees do not exceed $2 more than the membership dues rate set from Section 2.

G. The Club can provide money support to the system operators from general membership funds as available or deemed necessary. The amount cannot exceed more than $50 per calendar year per BBS system.

H. It is the duty of the system operator to police his/her own system. This includes deleting messages that contain unaccepted social conduct and words. The system operator may establish his/her own code of conduct regarding non-member users, providing said code of conduct is given to the current Board of Directors.

5. Membership:

A. Membership to the Glenside Color Computer Club of Illinois is open to anyone that owns and/or uses a Tandy Color Computer 1, 2 or 3.

B. No restrictions shall be placed on membership that is in conflict with local, state or federal laws.

C. Members are considered in good standing as long as they maintain their annual dues and abide by a basic code of conduct established by current society rules, and they are entitled to all Club benefits and services offered by the Club.

D. Membership benefits and/or services may not change without 30-day advance notice. The only exception to this policy is if a benefit or service is found not to be in the best interest of the Club as a whole.

E. Members can and will lose their Club rights and forfeit their dues if found in violation of these bylaws and/or the code of conduct established by current society rules. A 30-day notice must be issued from the Board of Directors to the member in question, informing him/her of the actions being brought against said member. Such actions will not be taken without a careful and complete review by the Board of Directors.

F. Members can bring to Club meetings friends and/or other family members. However, if young children are brought, it is the responsibility of the member to watch over said children at all times.

6. Club Policy:

A. The Glenside Color Computer Club of Illinois does not in any way condone the duplication of any copyrighted material. The computer system provided at Club meetings is for the express use of meeting presentations. Any member or non-member found using this system for the duplication of any copyrighted material shall be subject to Club dissociation with or without advance notice.

B. In the event of Club dissociation, the member in question forfeits annual dues and will not be allowed to receive any further Club benefits or services.

C. In the event of Club dissociation, the non-member in question shall not be allowed to join Glenside. In addition, said non-member will not be allowed to enter into any Club-supported activity as a guest of another member. □

undertaking. Indeed, creating bylaws is no small project. When setting up your bylaws, you take into account the various needs and wants of the club, officers and members. When we drafted Glenside's bylaws, we had little outside information to go on. Only two of us had any idea of the format and information needed to put bylaws into effect. It took us almost six months to create a draft to present to the members. (I can tell you now, it was a *long* six months. The best way I can explain how to create your club's own guidelines is to present my club's bylaws; I think they are pretty self-explanatory.)

It took us about a year to get to this level, and all the early planning paid off. With bylaws, club objectives, meeting format and location all chosen, we were able to handle and accept new members as if we had been in existence for years. The plan of action formed during our early gatherings is still in place and still working. The Glenside Color Computer Club is one of the largest exclusive Color Computer Clubs today because we established objectives and goals that have stood the test of time.

Conclusion

Starting a CoCo Club can be hard work if you do not plan ahead. As with any club, you must know what you and your members want, and you must follow an appropriate code of conduct. The bylaws created by the Glendale Color Computer Club have helped our club to run smoothly and have guaranteed that our members can gain from their association with the club. If you are thinking about starting a CoCo Club, start with a pencil and paper and outline the club's objectives and goals. This will give you a great foundation on which to build.

Without Glenside, a large number of our members would have given up on the Color Computer years ago. We all know how special our CoCos are to us. We also know how lonely being a CoCo owner can be without a user support group. If you are currently without a CoCo Club in your community, there is no better time than the present to get one going. All it takes is a desire to share information and support with another CoCo owner.

(Questions or comments about this article may be directed to the author in care of Glenside Color Computer Club, 8 W. Stevenson Dr., Glendale Heights, IL 60139, Please include an SASE when requesting a reply.)

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2 Serial Ports, 1 Parallel, Clock, Disk Interface!

This multi I/O card is called the *"Eliminator"* because it provides all the I/O capability under OS-9 that most people want without the need for a Multi-Pak Interface. If desired, it is possible to use one or more ***Eliminators*** in a MPI or other bus expander, with or without other hardware.

The Eliminator is completely address decoded, and does not depend on any of the slot select capabilities of the MPI for device selection. The typical power consumption is well within the 300 mA at +5 VDC rating of all COCO models. Other voltages (+/- 12 VDC) are not required by the Eliminator.

2 Serial (RS-232C) Ports
- 15 software selectable baud rates from 50 to 38,400 baud - with alternate crystal can function as dual MIDI ports (31.25 KHz)

1 Parallel Printer Port

Real Time Clock
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- 100 year clock (automatically compensates for leap year)
- 50 bytes of battery backed scratchpad RAM

WD 1002-05 HD/FD Interface
- high speed (fastest COCO HD interface)
- WD 1002-05 supports up to 3 HDs and/or 4 FDs
- runs both HDs and FDs in **"no-halt"** mode (no lost keystrokes)
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Our top of the line system features Bruce Isted's new interface *'The Eliminator'* for the Western Digital WD 1002-05 high speed controller. **Features**; fastest system available, 1 megabyte transfer in only 37 seconds!! Twice as fast as other systems! Supports 4 floppy and 3 hard drives, type ahead for **both** floppy and hard disk, **autoboot** OS9 L1 or L2 from hard or floppy disk, **2 serial ports, 1 parallel port and Real Time Clock** socket. **Disadvantage**; does not support DECB. This is *the* system for the serious OS9 user.

KIT INCLUDES: ***'The Eliminator'***, Hard drive with WD 1002-05 controller, ST506 cable set, 3 foot 40 pin cable, Hard Drive Case with 60 watt power supply and fan, OS9 software for LI and LII with source, Complete instructions. Easy one evening assembly.

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Assemble & Test any of the above add	60.00
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Parallel cable (Centronics)	30.00
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Floppy Cable Int & Ext	25.00
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This system features the Burke & Burke XT or XT RTC interface. **The hottest selling hard disk interface!** It uses popular and inexpensive IBM PC type drives and controllers. The drives and controller can be used in a PC at a later date if you want. For this reason it is the least expensive hard disk system available today. Not as fast as the *Eliminator* system but faster than any other system available. Note: Disk Extended Color Basic support and other software options are listed below. **Disadvantage**; requires a multi-pak.

KIT INCLUDES: Burke & Burke (B&B) XT PC interface. Hard drive with controller, 3 foot ST506 cable set. Hard Drive Case with 60 watt power supply and fan. Includes OS9 LI and LII software. 1 megabyte transfer in 45 seconds! Type ahead under OS9. Complete instructions. Easy one evening assembly.

1 YEAR MANUFACTURES WARRANTY ON ALL SYSTEMS!

20 Meg Kit Complete 60MS	***498.00**
30 Meg Kit Complete 60MS RLL	***548.00**
40 Meg Kit Complete 60MS	***618.00**
Assemble and test any of the above add	**50.00**
OPTIONS:	
B&B Real Time Clock (add to above)	**30.00**
B&B XT ROM Auto Boot from hard disk	**19.95**
B&B Hyper I/O run DECB on hard drive	**29.95**
B&B Hyper III Ramdisk/spooler for above	**19.95**
FBU Fast Hard disk Back Up	**75.00**
R.S.B. RS Disk Basic under OS9	**39.95**

Hard Drive Bits and Pieces

B&B XT PC style interface	**69.95**
B&B XT RTC interface w/clock/calendar	**99.95**
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SPECIFICATIONS: size 16" deep, 5.5" high, 7" wide. 60 Watt power supply with 3 drive type power connectors, quiet 12 volt DC fan, LED power indicator, color matches CoCo. Holds 2 1/2 height hard or floppy drives and has card guided space for a PCB the size of a drive (like the WD1002-05 controller)

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Clubs, Clubs, Clubs

We have compiled a list of Color Computer Clubs because of the many requests we have received. CoCo Clubs may wish to exchange newsletters, share ideas for topics of discussion at monthly meetings, etc.

Please let us know if we have omitted any clubs and send us complete up-to-date addresses. Only those clubs that have signed our non-piracy "agreement form" will appear in this listing of CoCo Clubs. Also, please notify us if you wish to add or delete any names on this list. Send your information to:

CoCo Clubs
THE RAINBOW
The Falsoft Building
P.O. Box 385
Prospect, KY 40059

— Sue Evans

ARIZONA

Tucson Color Computer Club, Bruce Smith, 3030 Mustang Dr., Tucson, 85708, (602) 747-7859

CALIFORNIA

Color America Users Group, Jack W. Eizenga, 3811 N. Foster Ave., Baldwin Park, 91706, (818) 960-8010

Los Angeles-Wilshire Color Computer Users Group, Milton Wolfe, P.O. Box 11151, Beverly Hills, 90213, (213) 558-4909

United Computer Federation, (San Fernando Valley Chapter and Headquarters), Pete Ellison, P.O. Box 11332, Burbank, 91510, (818) 843-4156

The Davis CoCoNuts, Shneor Sherman, 1818 Haussler Dr., Davis, 95616, (916) 758-3195

South Bay Users Group (S-Bug), Bill Tillerson, 73 Alamitos Ave., Suite #2, Long Beach, 90802, (213) 432-3037

COLORADO

Colorado Color Computer Club, Lloyd Carroll, 6651 Bellaire Street, Commerce City, 80022, (303) 288-6369

The ESCO Computer Club, David E. Schulz, 1299 Harrison Street, Denver, 80206, (303) 388-6988

CONNECTICUT

The Southeast Connecticut Color Computer Users Group, Bill Gross, 30 Sycamore Lane, Groton, 06340, (203) 448-1388

FLORIDA

Color Computer Club of Brandon, Richard Steinbrueck, 2913 John Moore Road, Brandon, 33511, (813) 681-1526

Northwest Florida CoCo Nuts, Victor T. Majko, P.O. Box 1032, Fort Walton Beach, 32549, (904) 651-5638

Alachua County Color Computer Club, Jeff Mercer 1654 N.W. 14th Ave., Gainesville, 32605, (904) 372-5771

FLORIDA (cont'd)

Jacksonville Color Computer Club, William H. Brown III, 2454 San Sago Ln., Jacksonville, 32216, (904) 721-0282

Color-6809 Users Group, Kathie Lamb, 6995 29 Terr. No., St. Petersburg, 33710, (813) 345-8522,

GEORGIA

The CoCo Cartel, Tory Torres, 1345 Sturkie Drive, Columbus, 31907, (404) 561-1062

The Northeast Atlanta Color Computer Club, Alan R. Dages, 4894 Candlewood Ln., Stone Mountain, (404) 469-5111

IDAHO

Snake River Color Computer Club, Emil Franklin & Robert Kitchen, 1750 Carmel Drive, Idaho Falls, 83402, (208) 522-0220

ILLINOIS

Illinois Color Computer Club of Elgin, Tony Podraza, 119 Adobe Circle, Carpentersville, 60110, (312) 428-3576

Capital CoCo Club, Kevin L. Adair, 5753 S. Laflin, Chicago, 60636, (312) 737-5716

Chicago OS-9 Users Group, Roger Halvorsen, 1598 Ardmore Ave., Glendale Heights, 60139, (312) 469-8174

Glenside Color Computer Club, Ed Hathaway, 8 W. Stevenson Drive, Glendale Heights, 60139, (312) 462-0694

Kitchen Table Color Computer Group, Robert Mills, P.O. Box 464, Hanover, 61041, (815) 591-3377

Motorola Microcomputer Club, Steve Adler, 1301 Algonquin Rd., Schaumburg, 60196, (312) 576-3044

INDIANA

Indianapolis Color Computer Club, Scott Griepentrog, P.O. Box 24285, Speedway, 46224, (317) 241-6401, BBS (317) 244-3159

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, MI 49091, (616) 651-4248

IOWA

Metro Area Color Computer Club (MACCC), Joseph Callavaro, 2425 Ave. A, Council Bluffs, 51501, (712) 322-2438

Mid Iowa CoCo, Terry G. Simons, 1328 48th Street, Des Moines, 50311, (515) 279-2576

KANSAS

Hutchinson Color Computer Club, John Collicott, 201 E Morgan, Inman, 67546, (316) 585-2320

KC CoCo Club, Gay Crawford, P.O. Box 11192, Kansas City, 66111, (913) 764-9413

KENTUCKY

Perry County CoCo Users Group, Keith W. Smith, Box 482 Bulan, 41722 (606) 439-4209

LOCO-COCO, Jerry Yates, 3005 Bob White Ct., Louisville, 40216, (502) 448-3746

Hardin County Color Computer Club, Paul W. Urbahns, 2887 Republic Ave., Radcliff, 40160, (502) 351-4757

LOUISIANA

The CoCo Sig, Christopher Mayeux, 20 Gibbs Drive, Chalmette, 70043, (504) 277-6880

MASSACHUSETTS

CLUB 6809, Jean Salvas, 204 East Street, Springfield, 01104, (413) 734-5163

MICHIGAN

Greater Kalamazoo Color Computer Club, Jim Rix, 1835 Chevy Chase Blvd., Kalamazoo, 49008, (616) 344-7631

Greater Lansing Color Computer Users Group, E. Dale Knepper, P.O. Box 14114, Lansing, 48901, (517) 626-6917

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, MI 49091 (616) 651-4248

Color Computer Owners Group, Bernie Patton, 388 Emmons, Wyandotte, 48192, (313) 283-2474

MINNESOTA

Gallifrean Recall Circuit, Dr. Who Fan Club/Newsletter, Robert Hermanek, 216 Cardinal Ct., Chaska, 55318, (612) 448-7911

Northern Minnesota CoCo Community, David B. Smith, c/o Grand Portage Lodge, P.O. Box 307, Grand Portage, 55605 (218) 475-2520

MISSISSIPPI

Singing River C.C. Club, James F. Wilson, 2619 Wilson Ave., Pascagoula, 39567, (601) 762-4318

MISSOURI

KC CoCo Club, Gay Crawford, P.O. Box 11192, Kansas City, KS 66111, (913) 764-9413

Coconuts, Tom Colston, 1610 N. Marlan, Springfield, 65803, (417) 865-8015

NEBRASKA

Siouxland Color Computer Club, Alan Pedersen, 611 D Street, South Sioux City, 68776, (402) 494-2284

NEW JERSEY

Mercer County Color Computer Users Group, Richard C. Kelly, 1904 Country Lane, W. Trenton, 08628, (609) 883-9270

NEW YORK

Kings Byte CoCo Club, Morty Libowitz, 1063 East 84th St., Brooklyn, 11236, (718) 763-4233, BBS (718) 837-2881

Twin Tiers CoCo Club, William Cecchini, 319 Irvine Place, Elmira, 14901, (607) 734-0065

The Island CoCo Club, D.K. Lee, P.O. Box 426, Massapequa Park, 11762, BBS (516) 277-1285

Olean Area CoCo Users Group, Herman L. Smith, P.O. Box 216, Olean, 14760, (716) 933-7488

Broome CoCo Club, Lloyd Shotwell, 18 Adaline Street, Owego, 13827, (607) 687-3231

OHIO

Color Computer Club, Inc., Larry Cadman, P.O. Box 478, Canfield, 44406

The Columbus and Central Ohio Color Computer Club, Frank J. Piper, P.O. Box 322423, Columbus, 43232, (614) 868-5316

The Utopia Network, Bruce Uher, 145½ Park Ave., Coshocton, 43812, (614) 622-4061

Dayton Color Computer Users Group, Steven E. Lewis, 4230 Cordell Dr., Dayton, 45439, (513) 299-3060

Tri-County Computer Users Group, William J. Loeffler, 2612 Dale Avenue, Rocky River, 44116, (216) 356-0779

Greater Toledo Color Computer Club, Robin Jackson, 2053 Eileen Road, Toledo, 43615, (419) 531-4549

OKLAHOMA

Central Oklahoma Computer Organization, Inc., Mark Bosley, 6440 N. Peniel, Oklahoma City, 73132, (405) 721-3691

OREGON

Computron Research Users Group, Tom Sanders Blair, Jr., P.O. Box 370, Clackamus, 97015, (503) 668-8397

PENNSYLVANIA

HUG-A-CoCo, George Lurie, 2312 Wingfield Ct., Harrisburg, 17112, (717) 657-2789

The Hollidaysburg Area Color Computer Club, Victor Ricker, 511 Spruce St., Hollidaysburg, 16648, (814) 695-2792

Skyline Color Computer User Group, Lewis F. Brubaker, 3100 Kutztown, Rd., Lauderdale, 19605, (215) 921-3616

Pittsburgh Color Group, Ralph Marting, 309 Frazier Dr., Pittsburgh, 15235, (412) 823-7607

RHODE ISLAND

New England COCONUTS, Arthur J. Mendonca, P.O. Box 28106, North Station, Providence, 02908, (401) 456-9394

SOUTH CAROLINA

LoCo CoCo Club, Larry Coyle, 4334 Flynn Dr., Charleston, 29405, (803) 747-0802

Spartanburg CoCo Club, Jesse W. Parris, 152 Bon Air Ave., Spartanburg, 29303, (803) 573-9881

SOUTH DAKOTA

Empire Area Color Computer Users Group of South Dakota, Carl Holt, 401 3rd Ave., Brandon, 57005, (605) 582-3862

TENNESSEE

Bradley County Personal Computer Users Group, Cynthia Pofeet, P.O. Box 2611, Cleveland, (615) 476-7274

Memphis Color Computer Users Group, Logan R. Ward, P.O. Box 11736, Memphis, 38111, (901) 685-0009

TEXAS

The Codis CoCo Symphony, William C. Garretson, 828 Gregory Avenue, Bedford, 76022, (817) 283-8571

UTAH

Salt City CoCo Club, Jim Shoop, 1900 Leisure Ln., Salt Lake City, 84107, (801) 968-3600

VIRGINIA

Southwestern Va., Color Computing Club, Richard Sutphin, Rt. 1 Box 20, Henry, 24102 (703) 365-2018

Richmond Area Color Computer Organization, William Mays, 6003 Westbourne Drive, Richmond, 23230, (804) 282-7778

Northern Virginia C.C. Club, William Thompson, 1300 Kolman Court, Woodbridge, 22193, (703) 590-5870

WASHINGTON

Northwest CoCo Club, Dennis Mott, N. 4103 Whitehouse, Spokane, 99206, (509) 325-3399

WEST VIRGINIA

Huntington Area Color Computer Symposium, Jim Bush, P.O. Box 391, Lesage, 25537-0391, (304) 736-5314

WISCONSIN

Southern Wisconsin CoCo Club, David C. Buehn, 24607 67th Street, Salem, 53168, (414) 843-3830

WYOMING

Cowboy Color Computer Club, Craig Sullivan, 4601 Hill Top Ave., #C2, Cheyenne, 82009 (307) 778-8526

CANADA

ALBERTA

The Calgary Color Computer Club, P.O. Box 22, Station M, Calgary, Alberta, T2P 2G9, (403) 288-9696

BRITISH COLUMBIA

Vancouver Colour Computer Club, Box 76734, Stn S, Vancouver, British Columbia, V5R 5S7

Salmon Arm CoCo, David Coldwell, RR #4, Site 26 Comp. 13, Salmon Arm, British Columbia, V1E 4M4

ONTARIO

London CoCo Nuts Computer Club, Mark Watts, 36 Nottinghill Cres., London, Ontario, N6K 1R1, (519) 471-1345

ESSA Color Computer Club, Lorraine Shantz, RR #2, Minesing, Ontario, L0L 1Y0, (705) 726-5694

ONTARIO (cont'd)

Ottawa 6809 Users Group, Norm Shoihet, 1497 Meadowbrook Road, Ottawa, Ontario, K1B 5J9, (613) 741-1763

Durham 80-C Computer Club, Rick Gibson, P.O. Box 95, Whitby, Ontario, L1N 5R7, (416) 434-2886

QUEBEC

Club d'Ordinateur Couleur du Quebec, Inc., L. Rochon, Centre de Loisirs St-Mathieu, 7110- 8e Ave., St-Michel, Montreal, Quebec, H2A 3C4, (514) 682-9789

Les CoCophiles, Yves-Denis Girard, 17 Borde-de-l'eau, Repentigny, Quebec, J6A 3K2, (514) 581-1385

FOREIGN

AUSTRALIA

CoCoHUG (Color Computer Hobart Users Group), Jim Shaw, 20 Greenacres Rd., Geilston Bay, Hobart, Tasmania, Australia 7005, (002) 43-9722

Pine Rivers/Peninsula User Group, T. Kerr, C/-31 Brooks Rd., Bray Park, Queensland, Australia, 4500, (07) 205-4879

Australian Christian Users Group, Captain Raymond L. Isaac, 90 Fowler St., MOE, Victoria, Australia 3825, (051) 27-2695

COLOMBIA

CoCoByte, Fabian A. Rodriguez, Avenida 4A #49N-60 or A.A. 5976, Cali, Colombia, 51-923-640705 or 51-923-649165

ENGLAND

National Dragon Users Group, Paul R. Grade, 6 Navarino Rd., Worthing, Sussex, England, 0903-207585

ISRAEL

The Mid-East CoCo Club, J. Yosef Krinsky, 526/11 Kiryat Kaminitz — Neve Yaacov, P.O. Box 27355 Jerusalem, Israel

WEST GERMANY

The Greatest German CoCoCooks, Michael Herbes, Dorfstr 23, 4320 Hattingen, West Germany

CORRECTIONS

"Warped Animation" (October 1988, Page 102): The author of *Gravitational Grid* has written to give his current address for those wanting to correspond with him. The address given in the article is now out of date.

Patrick D. Grengs II
Box 259 / Graduate Center
Pullman, WA 99163

"Showing Off Random Graphics" (Novices Niche, November 1988, Page 75): Line 230 of Listing 2, *Ellipse*, is incorrect as listed. Replace Line 230 as follows:

```
230 PCLS1:GOTO 100
```

"Quick Fixes" (October 1988, Page 58): A correction to Figure 2 of this article appeared in the November 1988 issue. That correction was not needed. The figure in question is correct as published. The designation of IC4 Pin 3 is correct.

For quicker reference, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type `DATA` at the CoCo SIG> prompt and `INFO` at the TOPIC> prompt.

RAINBOW
FEST
CHICAGO
April 14-16

RAINBOWfest is the only computer show dedicated exclusively to your Tandy Color Computer.

Nowhere else will you see as many CoCo-related products or be able to attend free seminars conducted by the top Color Computer experts. It's like receiving the latest issue of THE RAINBOW in your mailbox!

RAINBOWfest is a **great opportunity** for commercial programmers **to show off new and innovative products for the first time. Chicago is the show** to get information on capabilities for the CoCo, along with a terrific selection of the latest CoCo software. In exhibit after exhibit, there will be demonstrations, opportunities to experiment with software and hardware, and special RAINBOWfest prices.

Set your own pace between visiting exhibits and attending the valuable, free seminars on all aspects of your CoCo — from improving BASIC skills to working with the sophisticated OS-9 operating system.

Many people who write for THE RAINBOW — as well as those who are written about — are there to meet you and answer questions. You'll also meet lots of other people who share your interest in the Color Computer. It's a person-to-person event and a tremendous learning experience in a fun and relaxed atmosphere.

A special feature of RAINBOWfest is the **CoCo Gallery Live Showcase,** where CoCo artists enter their own graphics creations for display at the show. Cash prizes are presented and winning entries are decided by votes from RAINBOWfest attendees. (See the following page for more details.) As an additional treat for CoCo Kids of all ages, we've invited frisky feline CoCo Cat to join us for the show. RAINBOWfest has something for everyone in the family!

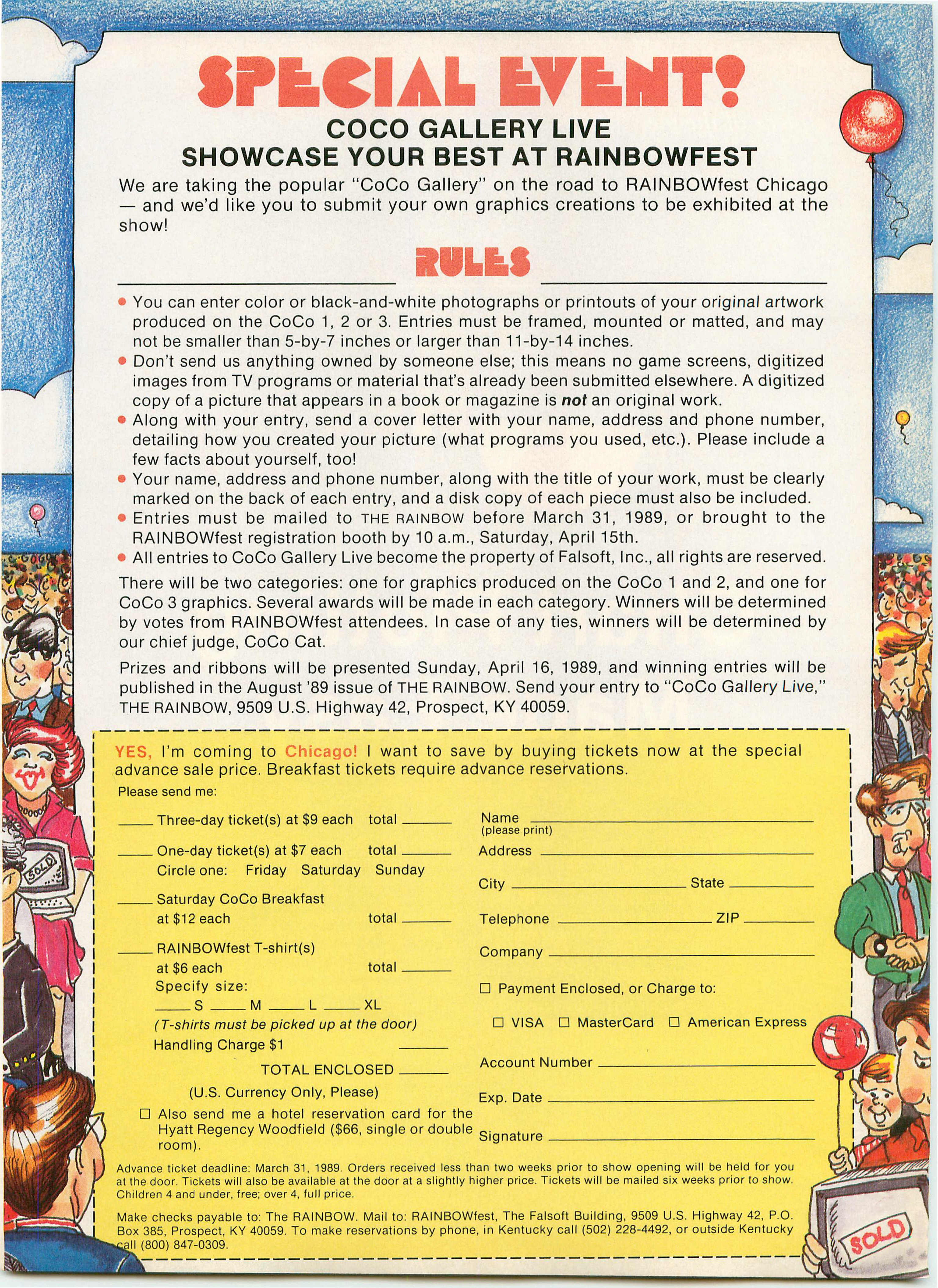
If you missed the fun at our last RAINBOWfest in Princeton, why don't you make plans now to join us in Chicago? For members of the family who don't share your affinity for CoCo, there are many other attractions in the Chicago area.

The Hyatt Regency Woodfield — Schaumburg, Illinois offers special rates for RAINBOWfest. **The show opens Friday evening** with a session from 7 p.m. to 10 p.m. It's a daytime show Saturday — the CoCo Community Breakfast (separate tickets required) is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs until 6 p.m. On Sunday, the exhibit hall opens at 11 a.m. and closes at 3 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get a special room rate.

The POSH way to go. You can have your travel arrangements and hotel reservations handled through RAINBOW affiliate, POSH Travel Assistance, Inc., of Louisville. For the same POSH treatment many of our exhibitors enjoy, call POSH at (502) 893-3311. All POSH services are available at no charge to RAINBOWfest attendees.

BE THERE!



SPECIAL EVENT!

COCO GALLERY LIVE
SHOWCASE YOUR BEST AT RAINBOWFEST

We are taking the popular "CoCo Gallery" on the road to RAINBOWfest Chicago — and we'd like you to submit your own graphics creations to be exhibited at the show!

RULES

- You can enter color or black-and-white photographs or printouts of your original artwork produced on the CoCo 1, 2 or 3. Entries must be framed, mounted or matted, and may not be smaller than 5-by-7 inches or larger than 11-by-14 inches.
- Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is ***not*** an original work.
- Along with your entry, send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.). Please include a few facts about yourself, too!
- Your name, address and phone number, along with the title of your work, must be clearly marked on the back of each entry, and a disk copy of each piece must also be included.
- Entries must be mailed to THE RAINBOW before March 31, 1989, or brought to the RAINBOWfest registration booth by 10 a.m., Saturday, April 15th.
- All entries to CoCo Gallery Live become the property of Falsoft, Inc., all rights are reserved.

There will be two categories: one for graphics produced on the CoCo 1 and 2, and one for CoCo 3 graphics. Several awards will be made in each category. Winners will be determined by votes from RAINBOWfest attendees. In case of any ties, winners will be determined by our chief judge, CoCo Cat.

Prizes and ribbons will be presented Sunday, April 16, 1989, and winning entries will be published in the August '89 issue of THE RAINBOW. Send your entry to "CoCo Gallery Live," THE RAINBOW, 9509 U.S. Highway 42, Prospect, KY 40059.

YES, I'm coming to **Chicago!** I want to save by buying tickets now at the special advance sale price. Breakfast tickets require advance reservations.

Please send me:

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☐ Also send me a hotel reservation card for the Hyatt Regency Woodfield ($66, single or double room).

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Company ____________________

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Account Number ____________________

Exp. Date ____________________

Signature ____________________

Advance ticket deadline: March 31, 1989. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to show. Children 4 and under, free; over 4, full price.

Make checks payable to: The RAINBOW. Mail to: RAINBOWfest, The Falsoft Building, 9509 U.S. Highway 42, P.O. Box 385, Prospect, KY 40059. To make reservations by phone, in Kentucky call (502) 228-4492, or outside Kentucky call (800) 847-0309.

Feature CoCo 3 Disk Tape Mod.

Slicing a piece of the pie

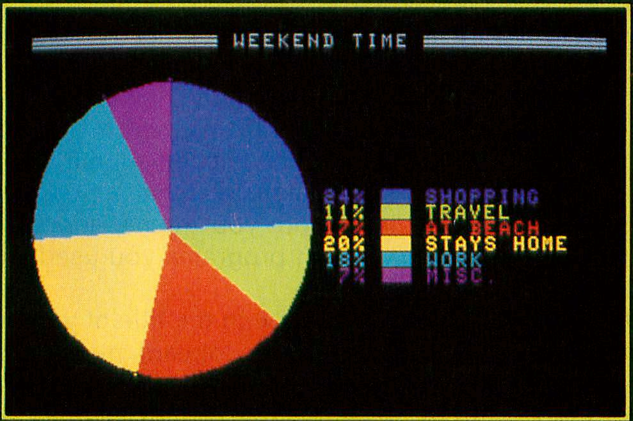

Chart Plotting Made Easy

By Eric Wolf

Pie Plotter helps Color Computer 3 users to draw multi-color pie graphs from self-entered data. The program runs on either an RGB or composite monitor and requires a disk drive for loading and saving graphs. (It is possible to modify the program for use with a cassette.) The program utilizes the high speed poke and the 320-by-192, 16-color Hi-Res screen for graphics. The program allows 14 separate data samples and graphs each in its own color. The chart includes labels and percentages. The program will make the task of designing pie graphs a snap for both the beginner and the expert.

Eric Wolf is a 15-year-old high school student who has been programming for the CoCo for three years. His achievements include F-15 Assault Simulator *and* CoCo Newsroom.

Operating Instructions

Enter the program from Listing 1 and save it to disk. Now type RUN and press ENTER to start the program. The Settings Control menu should now appear on the screen with blank graph data listed. This is where you will do most of your work. The text in green is your data and the purple line at the bottom is your current title for the graph. The pink text at the right of the screen identifies the commands you may execute to alter or display this data. The following commands are available:

- Shadow Graph: Pressing S toggles this command between yes and no. If toggled to yes, the graph will have a gray shadow behind it when drawn on the screen. If toggled to no, no shadow will appear when the graph is drawn.

- Modify Entry: Pressing M gives you the chance to alter the data in one of the fourteen data slots in the data column. After pressing M, enter the number of the slot you wish to modify (1 to 14). After entering an appropriate slot, enter the data value. Any number, zero to 9,000, will work. Now enter the label for the data. The data will be entered into the data column accordingly. To exit the Modify menu, enter `999`.
- Plot Chart: Press P to plot the data on the screen on a pie chart. The screen will clear, and the graph, percentages, labels and graph title will be drawn. After the chart has been drawn, press any key to return to the main menu. The graph is plotted according to the relation of a specific number to other numbers in the data table (standard for the pie graph), and uses sine and cosine ratios to determine line placement.
- Clear Graph Data in Memory: Pressing C clears data from memory. You will be asked if you want to clear the data. Press Y to clear the data or N to abort the clearing process.
- Degree of Rotation: Pressing D in the editor will increase this number by 2 degrees. The degree of rotation signifies the degree number at which the first line of the graph will be drawn. Usually, you can keep this value at 0, but other values will tilt your graph for added effects.
- Title: Pressing T allows you to enter a new title for your graph. Type the new title and press ENTER. A title can be no longer than 30 characters. The title will appear at the top of the screen when the chart is displayed graphically.
- Input/Output: Pressing I at the first screen will take you to the Input/Output control menu. From this menu, you have the following options:

1. Clear: Entering 1 will clear the graph currently in memory.
2. Load: Press 2 to load a previously saved graph from disk. Enter the filename or enter `DIR` for a disk directory. The graph will now load and be displayed. Press any key to continue.
3. Save: Pressing 3 enables you to save the graph in memory to disk. Enter the filename you want to use to save the graph or enter `DIR` for a disk directory. After the graph is saved, you will return to the Input/Output menu.
4. Display: To draw the chart you currently have defined from the control editor, press 4. (See the Plot chart option for more information.)
5. Demographics to Screen: Press 5 to see the demographics of the data you have selected on the screen. This will display the chart title, percentages, labels and units for the data in memory, and will display the amount of data accounted for pictorially in the graph. Press any key to continue.
6. Demographics to Printer: If you press 6, the graph data is sent to the printer.
7. Exit: Press 7 to return to the Control Editor.

Monitor Selection

Due to a flaw in the CoCo 3 system design, you cannot use the same color values to drive both an RGB-A and Composite monitor. Tell *Pie Plotter* which type of monitor you are using in Line 10. Change the variable to equal `1` if you are using a composite monitor or color TV, or leave the variable set at

MLBASIC 2.0 - BASIC Compiler

If you want your BASIC programs to run up to 50 times faster, or want more programming features without learning another language, MLBASIC is for you.

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- 80,40 or 32 column text displays

MLBASIC not only contains everything that you would expect a BASIC programming language should contain, MLBASIC has features that offer flexibility of other languages like C, Pascal, FORTRAN and even assembly language. These features will allow programmers to directly access the CPU registers on the COCO, produce modular program code with SUBROUTINES, manipulate memory in blocks, and even call ROM routines in other areas of memory.

MLBASIC revision 2.0 has incorporated all enhancements that were suggested by MLBASIC 1.0 users and more. Revision 2.0 did away with all the incompatibility problems that existed with revision 1.0.

MLBASIC allows for the first time user to quickly compile a program using default compiler settings. The advanced user has the capability of controlling over a dozen settings which control where the program is compiled, which medium to compile to (memory or disk), string space, compiler listings and more.

With all this going for MLBASIC, your might expect the cost to be a little out of your budget. After looking at prices of other BASIC compilers for the COCO 3 you might be correct. But look again at this ad; for only $59.95, you can have a programming language that will spark your interest once again in the COCO.

Before you buy another BASIC compiler for the COCO, find out if it supports everything MLBASIC supports. Then look at the price tag. We feel that it won't be long before you place an order for MLBASIC.

"MLBASIC is a fine program for any serious programmer," said David Gerald in the December 1987 RAINBOW.

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The RAINBOW, July 1987

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0 if you are using a black and white television or an RGB-A monitor.

Sample Session

To get started, pretend you are writing a report about how people spend their time on the weekends. You have sampled several groups of people and have 487 responses covering all ages. You now need a way to effectively communicate this information to your reader. With my program, you can plot a pie graph of this information. To begin, start the program with no information in the editor.

Through your study, you have determined that 120 of the people polled spend their weekends shopping. Press M to modify a slot in your graph, and enter 1 to modify the first blank in your graph. Now enter 120 to signify the number of people represented by this slot. Next enter the label to go along with this: `SHOPPING`.

Next you have 54 people who like to travel on the weekend. Again, press M and enter 2 to alter the second slot. (Remember, Slot 1 has been filled.) Enter 54 to signify the number of people traveling and enter `TRAVEL` for the label.

Now you have 87 people who like to go to the beach for the weekend. Press M and enter 3. Now enter 87 for the number of people and `AT BEACH` for the label.

You have a majority of your survey, 98 people, who like to stay at home, watch TV, or do things around the house all weekend. Press M and enter 4. Enter the number 98 for this group and label them `STAYS HOME`. You also have a group of people who work on the weekend. Press M and the number 5 to modify Slot 5. Now enter the number 90 and label this group `WORK`. Finally, to round off your survey, you have 38 people who don't fit into any specific category. Press M and enter 6. Now enter the number 38 and then label the group `MISC`.

To title your graph, press T, type `What People do on a Weekend` and press ENTER. Your graph is now complete. To view it, press P. The graph will be drawn and displayed. Press any key to return.

Now you can save, change, or do whatever you want with your graph. That should help you get started. Have fun and happy graphing.

A Note to Tape Users

A final note to CoCo 3 tape users: It is possible to change the program to allow tape saving and loading. All you have to do is change all 1s in the program to negative 1s. These will be found only in the save and load portions of the program, which are set off by `REM` statements.

In addition, you must delete any portion of the program dealing with disk usage (Ex: directory viewing). This is all listed at the end of the program listing.

(Questions or comments about the program may be directed to the author at 1630 N. Johnson Street, South Bend, IN 46628. Please include an SASE if requesting a reply.) ☐

26	17	140	114
40	20	170	195
58	45	196	105
92	173	END	55
110	54		

The listing: `PIECHART`

```
0 '*****************************
2 '* PIE CHART DISPLAY UTILITY *
4 '*  WRITTEN BY ERIC A. WOLF  *
6 '*  FOR A 128K TANDY COCO 3  *
8 '*****************************
10 MN=0' 0=RGB / 1=CMP
12 IF MN=0 THEN RGB:MN$="0011223
6542440482644575259606356" ELSE
CMP:MN$="00131145073921543602173
416326332"
14 FORY=0 TO 15:PALETTE Y,VAL(MI
D$(MN$,Y*2+1,2)):NEXTY
16 POKE65497,0:ATTR0,4:PCLEAR1:C
LEAR3200:DIM D(15),D$(15):GOSUB6
8
18 AD=&HF09D:FORY=AD+256 TO AD+2
62:POKE Y,255:NEXTY:POKE Y,0:FOR
 Y=AD+216 TO AD+223:POKE Y,255:N
EXT:Y=AD+216:POKE Y,0:POKE Y+2,0
:POKE Y+7,0:POKE Y+5,0:AD=0
20 ATTR0,0:WIDTH40:CLS1:ATTR6,0:
PRINT"    The Color Computer 3 P
ie Plotter":ATTR5,0:PRINTTAB(9);
"Written by Eric A. Wolf":ATTR4,
0:PRINTTAB(3);"For a 128k TANDY
Color Computer 3":ATTR5,0:PRINTS
TRING$(40,"-");:LOCATE12,5:ATTR5
,0,U
22 PRINT"CONTROL SETTINGS";
24 ATTR0,0:T=0:FORY=1TO14:T=T+D(
Y):NEXTY:IF T=0 THEN T=.01
26 FORY=1 TO 14:LOCATE0,6+Y:PRIN
TSTRING$(26,32);:LOCATE3-LEN(STR
$(Y)),6+Y:PRINTY;:LOCATE3,6+Y:PR
INT")";:LOCATE4,6+Y:PRINTD(Y);:L
OCATE10,6+Y:PRINTD$(Y);:Z=INT((D
(Y)/T)*100)
28 Z$=STR$(Z):Z$=RIGHT$(Z$,LEN(Z
$)-1)+"%":LOCATE 25-LEN(Z$),6+Y:
PRINTZ$;:NEXTY:ATTR5,0:LOCATE26,
8:PRINT"(S)hadow Pie?";
30 LOCATE26,11:PRINT"(M)odify En
try";:LOCATE26,13:PRINT"(P)lot C
hart":LOCATE26,15:PRINT"(I)nput/
Output";:LOCATE26,17:PRINT"(C)le
ar data":LOCATE26,19:PRINT"(D)eg
ree start";
32 IF SH THEN A$="YES" ELSE A$="
NO"
34 ATTR6,0:LOCATE30,9:PRINT"- ";
A$:LOCATE30,18:PRINTSTRING$(8,32
):LOCATE32,20:PRINTAD:ATTR5,0
36 B$=STRING$(40,32):ATTR6,0:LOC
ATE0,21:PRINTB$:LOCATE0,22:PRINT
"(T)ITLE> ";:ATTR2,0:PRINTT$:ATT
R5,0
38 LOCATE38,23:FL=0
```

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```
 40 A$=INKEY$:IFA$="S" THEN FL=1:
IF SH=1 THEN SH=0:GOTO32 ELSE SH
=1:GOTO32
 42 IFA$="T" THEN LOCATE9,22:ATTR
6,0:PRINT STRING$(60,32);:LOCATE
9,22:LINEINPUT T$:T=LEN(T$):T$=L
EFT$(T$,28):IF T>28 THEN 20 ELSE
 36
 44 IF A$<>"M" THEN 50 ELSE LOCAT
E0,22:PRINTSTRING$(40,32);:LOCAT
E0,22:LINEINPUT"Modify what unit
 (1-14/999 = exit) >";M$:M=VAL(M
$):IF M=0 OR M>14 THEN 50
 46 ATTR6,0:LOCATE0,22:PRINTSTRIN
G$(40,32);:LOCATE0,22:INPUT"Ente
r new unit VALUE ";D(M):IF D(M)>
9999 THEN 46
 48 LOCATE0,22:PRINTSTRING$(40,32
);:LOCATE0,22:INPUT"Enter new un
it LABEL ";D$(M):IF LEN(D$(M))>1
1 THEN 48 ELSE 24
 50 IF A$="D" THEN AD=AD+2:FL=2:I
F AD>359 THEN AD=0
 52 IF A$="I" THEN 108
 54 IF A$="C" THEN LOCATE0,22:PRI
NTSTRING$(40,32);:LOCATE0,22:INP
UT"Sure you want to clear this (
Y/N) ";A$:IF LEFT$(A$,1)="Y" THE
N GOSUB68:GOTO20 ELSE 32
 56 IF A$="P" THEN C2=CO:GOSUB 78
:EXEC44539:HSCREEN0:CO=C2:GOTO20
 58 IF FL=1 THEN 20 ELSE IF FL=2
THEN 32 ELSE 40
 60 GOTO 60
 62 '
 64 REM ** CLEAR DATA TABLES **
 66 '
 68 B$=STRING$(11,46):FORY=1TO14:
D$(Y)=B$:D(Y)=0:NEXT:D(15)=9999:
SH=1:SC=1:MC=14:CO=1:T$="NO TITL
E":AD=0:ST=1
 70 RETURN
 72 '
 74 REM ** PLOT PIE CHART **
 76 '
 78 HSCREEN2:X1=77:Y1=100:RD=77:C
O=ST:R1=RD/2:R2=5:T=0:C=0:IF SH
THEN HCIRCLE(X1+R2-2,Y1+R2),RD,1
5:HPAINT(X1+4,Y1+4),15,15:C1=0
 80 C=C+1:IF D(C)=9999 THEN 86 EL
SE T=T+D(C):GOTO80
 82 IF D(C) THEN C1=C1+1
 84 GOTO80
 86 IF T=0 THEN T=.0001
 88 TX=10-INT(C1/2)
 90 C=C-1:AO=AD/3.6:FOR Y=1 TO C:
HCOLOR CO:HCIRCLE(X1,Y1),RD:IF F
IX((D(Y)/T)*100)=0 THEN 98 ELSE
AN=AO:A1=AO:GOSUB100:HLINE(X1,Y1
)-(X2,Y2),PSET
 92 AN=100*(D(Y)/T)+AO:AO=AN:A2=A
N::GOSUB100:HLINE(X1,Y1)-(X2,Y2)
,PSET:AN=A1+(A2-A1)/2:RD=RD-R1:G
OSUB100:HPAINT(X2,Y2):RD=RD+R1
 94 A$=STR$(FIX(D(Y)/T*100)):A$=R
IGHT$(A$,LEN(A$)-1):A$=STRING$(3
-LEN(A$)," ")+A$:A$=A$+"% @@ "+D
$(Y):HPRINT(19,TX),A$:TX=TX+1
 96 CO=CO+1:IF CO=MC+1 THEN CO=ST
 98 NEXTY:HCIRCLE(X1,Y1),RD,0:HCO
LOR15:A$=STRING$((40-LEN(T$))/2-
1,59)+" "+T$+" "+STRING$((40-LEN
(T$))/2-1,59):HPRINT(0,0),A$:RET
URN
 100 A=AN/57.141*3.6:X2=X1+SIN(A)
*RD:Y2=Y1-COS(A)*RD:RETURN
 102 '
 104 REM ** INPUT/OUTPUT
 106 '
 108 HSCREEN0:CLS:ATTR6,0:PRINTTA
B(3);"PIE CHART INPUT/OUTPUT CON
TROL MENU":ATTR5,0,U:PRINTSTRING
$(40,32);:ATTR6,0:PRINT:PRINTTAB
(9)"Please select a choice":ATTR
5,0:PRINT:PRINTTAB(42)"1. Clear
the data in memory":PRINT
 110 PRINTTAB(2)"2. Load in a cha
rt from disk":PRINT:PRINTTAB(2)"
3. Save a chart to disk":PRINT:P
RINTTAB(2)"4. Display the chart
in memory":PRINT:PRINTTAB(2)"5.
Print chart demographic (Screen)
":PRINT
 112 PRINTTAB(2)"6. Print chart d
emographic (Printer)":PRINT:PRIN
TTAB(2)"7. Exit back to the Sett
ings Control"
 114 ATTR6,0:LOCATE10,21:INPUT"Yo
ur Choice > ";CH:IF CH<1 OR CH>7
 THEN 114
 116 IF CH=1 THEN GOSUB68:GOTO20
 118 IF CH=4 THEN C2=CO:GOSUB78:E
XEC44539:CO=C2:GOTO108
 120 IF CH=5 THEN D=0:GOTO138
 122 IF CH=6 THEN D=-2:GOTO138
 124 IF CH=7 THEN 20
 126 IF CH=3 THEN 178
 128 IF CH=2 THEN 196
 130 STOP
 132 '
 134 REM ** PRINT DEMOGRAPHIC
 136 '
 138 CLS:IF D=-2 THEN LOCATE0,12:
PRINT"Ready printer and press an
y key to begin";:EXEC44539:POKE6
5496,0
 140 V=0:CLS:PRINT#D," TITLE: ";T
$:PRINT#D:PRINT#D," PERCENT   LA
BEL"+STRING$(11,32)+"UNITS":PRIN
```

```
T#D," ";STRING$(35,"-"):FORY=1TO
14:IF D(Y)=0 THEN 148 ELSE PRINT
#D," ";:PRINT#D,USING("##.##");(
D(Y)/T*100);:V=V+INT(D(Y)/T*1000
0)/100:P$=" % - "
142 P$=P$+D$(Y)+STRING$(16-LEN(D
$(Y)),32)+"("
144 P1$=STR$(D(Y)):P1$=RIGHT$(P1
$,LEN(P1$)-1):P$=P$+P1$+")"
146 PRINT#D,P$
148 NEXTY
150 PRINT#D," ";STRING$(35,"-"):
PRINT#D,USING("###.##");V;:PRINT
#D," % accounted for in graph":P
RINT#D:PRINT#D
152 IF D=0 THEN EXEC44539
154 POKE65497,0:GOTO 108
156 '
158 REM ** INPUT A FILENAME
160 '
162 ATTR5,0:LOCATE0,3:PRINT"Ente
r the filename of the graph in w
hichyou want to load or type DIR
 and enter  to view the disk dir
ectory of a drive orenter EXIT t
o exit back to the menu":ATTR6,0
164 LOCATE0,8:LINEINPUT"Filename
 (or DIR)=-> ";F$:IF F$<>"DIR" T
HEN RETURN
166 ATTR5,0:LOCATE0,9:LINEINPUT"
Directory of what drive (0-3) >"
;D$:DR=VAL(D$)
168 IF DR<0 OR DR>3 THEN 166 ELS
E PRINT::ATTR6,0:POKE65496,0:DIR
 DR:PRINT:PRINT"Free Gans= ";FRE
E(DR):EXEC44539:POKE65497,0
170 RETURN
172 '
174 REM ** SAVE A FILE
176 '
178 ATTR6,0:CLS:LOCATE3,1:PRINT"
- Save in a pie graph to disk -"
:GOSUB162
180 IF F$="EXIT" THEN 108
182 IF F$="DIR" THEN 178 ELSE AT
TR6,0:CLS:A$="Save the file "+F$
:LOCATE20-LEN(A$)/2,5:PRINTA$:LO
CATE0,10:ATTR5,0:PRINT"Press SPA
CEBAR to save the file or pressa
ny other key to exit back to the
 Input/Output Menu.."
184 A$=INKEY$:IFA$=" " THEN 186
ELSE IFA$<>"" THEN 108 ELSE 184
186 ATTR6,0:LOCATE10,15:PRINT"Sa
ving Graph Now....":POKE65496,0:
OPEN"O",#1,F$
188 PRINT#1,SC:PRINT#1,ST:PRINT#
1,MC:PRINT#1,SH:PRINT#1,DG:PRINT
#1,AD:PRINT#1,T$:FORY=1TO15:PRIN
T#1,D(Y):PRINT#1,D$(Y):NEXTY:CLO
SE#1:POKE65497,0:GOTO108
190 '
192 REM ** LOAD A FILE
194 '
196 ATTR6,0:CLS:LOCATE4,1:PRINT"
- Load a pie graph from disk -":
GOSUB162
198 IF F$="EXIT" THEN 108
200 IF F$="DIR" THEN 196 ELSE AT
TR6,0:CLS:A$="Load the file "+F$
:LOCATE20-LEN(A$)/2,5:PRINTA$:LO
CATE0,10:ATTR5,0:PRINT"Press SPA
CEBAR to load the file or pressa
ny other key to exit back to the
 Input/Output Menu.."
202 A$=INKEY$:IFA$=" " THEN 204
ELSE IFA$<>"" THEN 108 ELSE 202
204 ATTR6,0:LOCATE10,15:PRINT"Lo
ading Graph Now...":POKE65496,0:
OPEN"I",#1,F$
206 INPUT#1,SC:INPUT#1,ST:INPUT#
1,MC:INPUT#1,SH:INPUT#1,DG:INPUT
#1,AD:INPUT#1,T$:FORY=1TO15:INPU
T#1,D(Y):INPUT#1,D$(Y):NEXTY:CLO
SE#1:POKE65497,0
208 C2=CO:GOSUB78:EXEC44539:HSCR
EEN0:C2=C0:GOTO108
210 '
212 REM ** TAPE CONVERSION
214 '
216 ' To convert this program to
218 ' work on a tape system, you
220 ' must change  all the #1 in
222 ' the lines above to #-1 and
224 ' delete the portion on disk
226 ' directory viewing.
228 '
230 '     << END OF PROGRAM >>
```

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Everything you ever
wanted to know about the CoCo
but were afraid to ask

Do You Have a Question?

By Cray Augsburg
Rainbow Technical Editor

You have bought your CoCo; you have all the necessities — monitor, cassette player or disk drive, and RAINBOW magazine. You're all ready to start using your Color Computer. Or are you?

If you are like most new computer users, you have some questions about equipment, general computer care, and typing in, loading, saving and running programs. Therefore, we at THE RAINBOW would like to take this opportunity in the Beginner's issue to answer some of the more commonly-asked questions about the CoCo.

CoCo Differences

? *Why does* THE RAINBOW *refer to different models of the Color Computer?*

There are three versions of the Color Computer, or CoCo: CoCo 1, CoCo 2 and CoCo 3. The newer the model, the more power and capabilities it has available. The CoCo 3 is the most powerful and versatile, with 128K (128 kilobytes of memory, but expandable to 512K) and the option of using OS-9 Level II. (OS-9 is a sophisticated and powerful computer operating system).

The first CoCo, which we now refer to as the CoCo 1, started with 4K RAM (Random Access Memory). It wasn't long before ways were found for these machines to access 64K, with 32K available to the user for BASIC programs. All CoCos contain ROM in addition to RAM. The ROM (Read-Only Memory) contains the BASIC language you can use for writing your programs. ROM interprets these programs by explaining to the computer what the program wants to do.

The CoCo 2 offers few capabilities over its older brother. The most notable differences include a smaller, sleeker case design and a completely revamped circuit board layout. A major difference is the lack of 12-volt supply inside the machine.

The CoCo 1 and 2 are able to use two different BASIC interpreters: Color BASIC and Extended Color BASIC. Extended Color BASIC offers several powerful features not included in the plain vanilla Color BASIC. These added features include math functions and, perhaps more important to many users, high resolution and graphics capabilities.

The CoCo 3 uses only one ROM chip. This chip contains "patched" versions of Color BASIC and Extended Color BASIC, in addition to new programming for the many enhancements in the machine. This added programming for colors, graphics, etc., is often referred to as "Super" Extended Color BASIC. It is because of these additions that most CoCo 3 programs won't operate on a CoCo 1 or 2. However, *most* programs written for the CoCo 1 and 2 *will* run on the CoCo 3.

? *How much memory is available in CoCos 1, 2 and 3? How do I find out how much memory is available in my machine?*

The CoCo 1 and 2 can hold 4K, 16K, 32K or 64K of memory. The CoCo 2 was marketed only in 16K and 64K varieties. To find out how much memory you have, enter `?MEM` and see what value is returned. In a 16K machine with Extended BASIC, you will have just over 8K for BASIC programs. (A disk drive will reduce this value by 2K.) On a 32K or 64K CoCo 1 or 2 without a disk drive, you will have exactly 24,871 bytes for BASIC programs. A disk system will reduce this value to 22,823 bytes. Keep in mind you can gain an extra 4.5K for BASIC programs on any CoCo by entering `PCLEAR1`. Of course, this means you won't be able to use graphics.

The CoCo 3 is sold as a 128K machine. An upgrade is available to increase this value to 512K. Entering `?MEM` on a CoCo 3 will return a value of 22,824 bytes (non-disk systems return 24,872 bytes) regardless of whether the machine is set for 128K or 512K. This is confusing to many people — you have only one byte more for BASIC programs on a CoCo 3 than on a CoCo 1 or 2.

The 6809 microprocessor in the CoCo can address only 64K at any one time. 32K of this 64K address space is taken up by the programming in the machine (the BASIC language and Disk BASIC). Of the other 32K, some is set aside for graphics. In addition, the disk controller "eats" another 2K, and there is some system overhead. The extra memory in a 128K CoCo 3 is used for graphics and for Hi-Res (40- and 80-column text). The memory above this in a 512K CoCo 3 is not accessible by BASIC in ordinary terms. In most cases, it isn't even supported by third-party software. This memory is intended for use with OS-9 Level II. OS-9 Level II, through the use of fancy memory management routines, gives you access to the full 512K in such a machine.

? *What are artifact colors?*

On a standard `PMODE4` screen, you can use two colors. The CoCo gives us the option of using a black and green set or a black and buff (white) set depending on the values we include with the `SCREEN` command. `SCREEN1,0` selects the black/green set and `SCREEN1,1` selects the black/buff set. If we are using `SCREEN1,1`, we can trick the system into allowing us to use red and blue as well — we have access to four colors. As the name implies, artifact colors are false. We can generate them because of a fault in

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the composite viewing part of the system. In other words, artifact colors work only on composite color monitors and televisions. We cannot trick the RGB monitor in the same way. Perhaps the best way to show you what I am talking about is to illustrate the point. Enter and run the following program.

```
10 PCLS
20 PMODE4,1
30 SCREEN1,1
40 LINE(100,0)-(100-191),PSET
50 LINE(101,0)-(101-191),PSET
60 LINE(110,0)-(110,191),PSET
70 LINE(115,0)-(115,191),PSET
80 GOTO 80
```

After running this program, you will notice the two side-by-side vertical lines created by Lines 40 and 50 combine to form the foreground color. The vertical line generated by Line 60 will be either red or blue and the line generated by Line 70 will be the opposite. The key is to remember that alternating vertical lines will generate the opposite artifact color. Note that I cannot tell you exactly which color will be in which place. This is the catch to artifact colors and is the reason many CoCo 1 and 2 programs instruct you to press the Reset button until a certain color is achieved. Pressing Reset allows the computer another chance to "come up" with the correct color. Note that this is not the case with the CoCo 3. Its artifact set is predictable. If the colors don't appear right, press and hold Reset, then press and hold F1. Now release the Reset button followed by the F1 key.

? *What's the difference between RGB and color composite video?*

To achieve a composite color signal from the computer, several different signals in the CoCo are combined and then sent out to the monitor over one wire. In an RGB (Red-Green-Blue) system, information for each of the three colors is sent to the monitor on a separate wire. RGB display is generally much clearer and crisper than that of a composite monitor or TV. For more complete information on monitors, see "A Guide to RGB Analog Monitors for the CoCo 3" (August 1987, Page 68) and "Monitor Updates" (November 1987, Page 33), both by Marty Goodman.

? *What are the differences among the* PMODE *screens?*

The Color Computer offers five different PMODEs in which to create graphics. As the PMODE number moves from 0 to 4, the resolution of the graphics screen increases. In other words, PMODE0 uses large blocks while PMODE4 uses small dots (pixels) for graphics. Some modes allow four colors while others allow the use of only two colors.

Screen	Resolution	Number of Colors	Memory
PMODE0	128-by-96	2-color	1 page
PMODE1	128-by-96	4-color	2 pages
PMODE2	128-by-192	2-color	2 pages
PMODE3	128-by-192	4-color	4 pages
PMODE4	256-by-192	2-color	4 pages

Table 1

The smaller the dots are, the more memory is required to store the picture. Memory for graphics is allotted in pages. One page of graphics memory equals 1,536 bytes. Table 1 shows the five PMODEs, their resolutions and the number of graphics pages required for each.

The Color Computer 3 offers Hi-Res graphics modes in addition to the PMODE screens described. These modes are as follows:

Screen	Resolution	Colors
HSCREEN0	low resolution	
HSCREEN1	320-by-192	4-color
HSCREEN2	320-by-192	16-color
HSCREEN3	640-by-192	2-color
HSCREEN4	640-by-192	4-color

These HSCREEN modes require more memory than the PMODE screens. However, because of the memory management on the CoCo 3, the memory used isn't taken from the memory you use for your BASIC program, as is the case with PMODE screens.

? *What languages can I use with my CoCo? What is a compiler?*

Obviously, BASIC is the native language of your CoCo. The machine is "born" with it in ROM. In the past, you could run Logo and Pascal (using the Deft Pascal compiler) under Disk BASIC. Currently, you must move to OS-9 in order to take advantage of other languages. Radio Shack sells a C compiler and a Pascal Compiler. In addition, it offers D.L. Logo for the educational market. Finally, OS-9 offers BASIC09. This version of the BASIC language offers data structures similar to Pascal and I/O formatting similar to FORTRAN, yet BASIC09 is flexible and easy to use.

When you run a program in Disk BASIC, each line of the program is interpreted by the computer as the program is run. While BASIC programs appear to work fast, this method is actually fairly slow. A compiler turns a source file — an ASCII text file — into machine code. This machine code is then run directly, or nearly so, by the computer without the need for translating each instruction during execution.

Typing in Programs

? *What do the numbers in the boxes shown before* RAINBOW*'s listings represent?*

The box you refer to is called the Check Plus box. For longer listings printed in THE RAINBOW, we provide this box of checksums to help you locate typographical errors when typing in programs. The numbers in the left-hand columns are line numbers in the program, and the right-hand numbers are the actual checksum values. Refer to Rainbow Info on Page 16 of this issue, and type in the Check Plus program you see there. Save the program and then run it. After it has run, start typing at the beginning of the program you want from THE RAINBOW. Immediately after you completely enter a line whose line number appears in the Check Plus box, press the down arrow key. A number will appear on the screen. This number should match that given in the box. If not, you know you have made a typing error somewhere in the lines between the last and current Check Plus line numbers.

? *What is a "packed" line?*

When typing in a line of BASIC code, you can enter up to 249 characters. However, some programmers find that they need a few characters more in certain complex lines. These programmers discovered they could add a couple of extra characters to the end of the line using Extended BASIC's EDIT command.

To do this, type the line as far as you can. When the cursor won't go any farther, press ENTER. Then edit the line by entering EDIT, followed by the line number in question. Now, press X to initiate EDIT's extend option; you will be able to enter three more characters.

RAINBOW does not condone the use of packed lines for two reasons: First, users unfamiliar with the technique are left at a loss as to how to add the last characters. Second, if such a listing is saved in ASCII format, the extra characters will be lost. For these reasons, we suggest you refrain from using the packing technique. Always check your listings for packed characters. We do our best to ensure there are no packed lines the magazine. Sometimes a line will slip by, though, and it is important to know how to handle the situation.

? *What is that upside-down, lowercase 'v' I see in some program listings?*

The upside-down 'v' is called a *caret*(^). In the computer world, this symbol is used to denote exponentiation — the mathematical process in which a number is raised to a power (multiplied by itself a given number of times). The phrase `X^2`, which simply means X*X, is commonly seen in listings. The caret does not appear on the CoCo keyboard. In order to generate it while entering a listing, press the up-arrow key. The screen will show an up arrow, but the CoCo will interpret the character as a caret. Printed listings will show the caret instead of the arrow.

The caret is one of several special characters that can be generated from the CoCo keyboard. Other characters available on the CoCo keyboard, and the method used to produce them, are as follows:

Character:	Press:
left bracket ([)	SHIFT-down arrow
right bracket (])	SHIFT-right arrow
underscore (_)	SHIFT-up arrow
backslash (\)	SHIFT-CLEAR

? *Is there a way to make my keys click as they are pressed?*

There is a way to get an audible indication that you have pressed a key. The following program will cause a tone to be played through the monitor speaker every time a key is pressed. Just run the program, type `NEW` and start typing with sound. The frequency of the tone can be changed using the `SOUND` command (i.e., type `SOUND 225,1`).

```
1 REM KEYTONES
2 REM BY JAMES PROVOST
10 FOR X=1536 TO 1551
20 READ A:POKE X,A
30 NEXT
40 POKE 360,6:POKE 361,00
50 DATA 52,86,198,1
60 DATA 134,4,61,253
70 DATA 0,41,189,169
80 DATA 86,53,86,57
```

? *I get an SN (Syntax) Error in a specific line that I have typed in. I have checked the appropriate line and it contains no typing errors. What is the problem?*

As stated in Brian White's article, "Learn to Walk Before You RUN" (Page 78 of this issue), a syntax error only occurs in the line where the error exists. This does not mean the error will be readily apparent. In some cases, a *glitch* will cause an invisible error. Simply retyping the line should clear this up. Also, some CoCos will allow certain spacing to be left out by the original programmer. Other CoCos will balk at this lack of spacing. Therefore, you might want to add some spaces, following guidelines presented in the CoCo manuals.

The other most frustrating error on the CoCo is the FC (Function Call) Error. It usually does not occur in the line the CoCo reports to you. Let's say you have a line as follows:

```
90 SOUND 263,5
```

The `SOUND` command cannot accept a value greater than 255, so an FC Error is generated when this line is executed. Now, let's say you decided to use a variable in place of the actual value and your program goes something like this:

```
70 A=263
80 PRINT"HELLO"
90 SOUND A,5
```

The computer would give you an FC Error in Line 90, but the problem is not in Line 90. That line is where the computer figured out you made a mistake. The actual error occurs in Line 70. Tracking down FC and other errors can be difficult and frustrating. You can gain some tips and techniques on this by reading "Don't String Me Along" (October '86, Page 100) by Ellen and George Aftamonow and "Escape From the Bug Zone" (January '87, Page 59) by Eugene Vasconi.

? *How can I stop a listing from scrolling by when I enter* `LIST`?

You can stop the scrolling by holding down the SHIFT key and simultaneously pressing the '@' key. To start scrolling again, press any key on the keyboard. This will also stop execution of a BASIC program.

? *Why must I enter* `RUN` *twice to execute some programs?*

Because of a bug the BASIC ROM routines, use of the `PCLEAR1` command from within a program will sometimes cause an FC (Function Call) Error. If this is the case, enter `RUN` a second time. The program should run normally. Many programmers "defeat" this bug by putting the command at the end of the program and writing their programs to work in the following manner:

```
10 GOTO 999
20 rest of program starts here and continues
999 PCLEAR1:GOTO 20
```

? *How do I type in machine language programs — with or without an assembler?*

Figure 1 shows how an assembly language program appears in THE RAINBOW. This example was taken from the October '88 installment of "Barden's Buffer" (Page 132). Notice how the listing appears to be in columns. While the first column shows the addresses at which the program parts are stored in memory, the second and third columns are the actual machine code values. The fourth column contains the line numbers used in the source listing, and the fifth column (the one with `HUNDRD` in it) is the label field. The sixth column shows the assembly mnemonics — instructions — used in the source file. The seventh column has the operands for the instructions, and the last column is the comments column.

If you are going to use an assembler to enter the program, you need to be concerned with the fourth through eighth columns. This is the actual source code used by the assembler. The first three columns are the resultant machine language code after assembly. At this point, consult your assembler manual to determine how it expects you to type in the source code. Then carry through the assembly process, and you will be on your way.

Those without an assembler can enter the machine language information in the first three columns to get a working copy of the program. You can do this with single values as shown in Rainbow Info on page 16 of this issue, or you might put together a BASIC listing in the following manner: By looking at the listing (keep in mind, we are concerned with only the first three columns) we can determine that the ML program occupies

```
3F00                00100         ORG     $3F00
3F00 8E   0400      00110 HUNDRD  LDX     #$400    POINT TO SCREEN
3F03 108E 0000      00120         LDY     #0       SET CHANGE FLAG TO 0
3F07 A6   80        00130 ONE10   LDA     ,X+      GET FIRST ENTRY
3F09 A1   84        00140         CMPA    ,X       COMPARE TO I+1
3F0B 23   0A        00150         BLS     ONE70    GO IF ENTRY I GE ENTRY I+1
3F0D E6   84        00160         LDB     ,X       GET SECOND ENTRY
3F0F E7   1F        00170         STB     -1,X     SWAP B TO A
3F11 A7   84        00180         STA     ,X       SWAP A TO B
3F13 108E 0001      00190         LDY     #1       SET "CHANGE"
3F17 8C   05FF      00200 ONE70   CMPX    #$5FF    TEST FOR SCREEN END
3F1A 26   EB        00210         BNE     ONE10    GO IF NOT ONE PASS
3F1C 108C 0000      00220         CMPY    #0       TEST CHANGE FLAG
3F20 26   DE        00230         BNE     HUNDRD   GO IF CHANGE OCCURED
3F22 39             00240         RTS              RETURN TO BASIC
          0000      00250         END
```

Figure 1

memory locations $3F00 through $3F22. And we know that each of these 35 locations can hold one byte (two hexadecimal digits). Therefore, the BASIC listing we would create, along with a means to save the ML program to disk, would look like this:

```
10 CLEAR200,&H3EFF
20 FOR X=&H3F00 TO &H3F22
30 READ A:POKE X,A
40 NEXT
50 SAVEM"EXAMPLE/BIN",&H3F00,&H3F22,&H3F00
60 DATA &H8E, &H04, &H00, &H10, &H8E
70 DATA &H00, &H00, &HA6, &H80, &HA1
80 DATA &H84, &H23, &H0A, &HE6, &H84
90 DATA &HE7, &H1F, &HA7, &H84, &H10
100 DATA &H8E, &H00, &H01, &H8C, &H05
110 DATA &HFF, &H26, &HEB, &H10, &H8C
120 DATA &H00, &H00, &H26, &HDE, &H39
```

? *Is it possible to prevent the use of the* BREAK *key?*

The following program will prevent the BREAK key from working on the CoCo 1 and 2 except where commands such as `LINEINPUT` and `INPUT` are looking for input from the keyboard:

```
10 REM BREAK DISABLE
20 FOR X=&H14A TO &H150
30 READ A:POKE X,A
40 NEXT
50 FOR X=&H19A TO &H19C
60 READ A:POKE X,A
70 NEXT
80 DATA 50,98,28,175,126,173,165
90 DATA 126,1,74
```

On the CoCo 3, just enter the following two pokes

```
POKE&HE414,0
POKE&HE42A,0
```

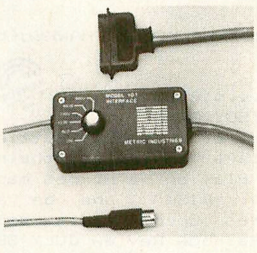
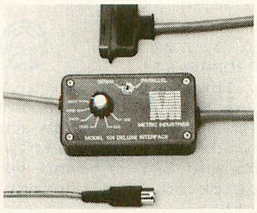
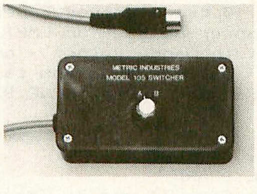
The Trials of Tape

? *What can I do to prevent I/O (Input/Output) Errors when loading programs on a tape system?*

The most common cause for an I/O Error when loading a tape-saved program is that the user is starting the load process in the middle of a recorded file. Make sure the tape is positioned to the silent spot just before the program you are trying to load. The quickest way to do this is using the `AUDIOON: MOTORON` command. Simply type the command and press ENTER. At the OK prompt, press the Play button on the recorder and fast-forward or rewind the tape to the approximate location before the file. Where a program is recorded, you will hear a high-pitched sound; a place of silence indicates where the tape is blank — between programs. Quickly stop the tape during a silent period, either by stopping the recorder or by pressing any key on the keyboard and ENTER. You can then type `CLOAD` to load the next program on the tape, or you can type `CLOAD"filename"` to have the computer search for a specific program. That is why it is important to leave a blank spot between programs when saving more than one file on a cassette.

Another cause for I/O Errors is an incorrect volume setting. Finding the right setting for a specific tape sometimes takes some effort. I suggest starting at a setting of 2 or 3. Then try to load the program. If it doesn't load, try again after increasing the setting by one half-step. Continue this process up to a setting of about 8.

If the load still won't work, the alignment of your recorder's playback head may differ greatly with the alignment of the head on the machine that recorded the tape. You can alter the alignment with a jeweler's cross-point screwdriver. To do this, disconnect the recorder from the computer and set the volume at a comfortable listening level. Play the tape in question. With the tape playing, put the screwdriver in the hole in the recorder's front panel. When you feel the screwdriver "seat" in the screw, you can turn it in either direction to change the head position. As you turn the screwdriver, listen for the crispest, brightest sound possible. When you reach this setting, reconnect the recorder to your CoCo and the program should load with no problem. The drawback to this method is that you will have to readjust the heads for subsequent tapes.

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- ★ Just turn the knob to select any one of 6 baud rates 300-9600
- ★ Comes complete with cables to connect to your printer and computer
- ★ Can be powered by most printers

Model 104 Deluxe Interface with "Modem Switch"

- ★ **Same Features as 101 Plus**
- ★ Built in Serial Port for your Modem or other serial device
- ★ Switch between Serial Output and Parallel Output
- ★ Comes with cables to connect to your computer and printer
- ★ Can be powered by most printers

Model 105 Serial Switch

- ★ Connects to your COCO to give you 2 switch selectable Serial Ports
- ★ Comes with a 3 foot cable to connect to your computer
- ★ Now you can connect your Printer (or printer interface) and your Modem (or other serial device) to your COCO and flip the switch to use either device
- ★ Does not require power

Cassette Label Printing Program

- ★ **New Version 2.1 prints 7 lines** of information on Cassette labels
- ★ Comes on Tape with instructions to transfer to disk
- ★ Menu driven, very easy to use
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- ★ Uses the features of your printer to print standard, expanded, and condensed characters
- ★ **Automatically Centers Each Line of Text**
- ★ Allows editing of label before printing
- ★ Program comes with 24 labels to get you started
- ★ 16K ECB required

Some of the Printers That Can –
Supply power for the 101 and 104 are Radio Shack, Star, Okidata, Brother, Juki, and Smith Corona.

Some of the Printers That Cannot –
Supply power for the interfaces are Epson, Seikosha, Panasonic, Silver Reed and NEC. If your printer cannot supply power to the interface you can order your interface with the "P" option or you can supply your own AC adapter. We recommend the Radio Shack 273-1431 AC adapter with a 274-328 connector adapter.

Write or call for more information or for technical assistance.

Price List

Model 101	**35.95**
Model 101P	41.95
Model 104	44.95
Model 104P	51.95
Model 105	14.95
Cassette Label Program	6.95
Pin Feed Cassette Labels:	
White	3.00/100
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Red-Blue-Yellow-Tan	

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However, I find this to be more convenient than spending several minutes trying to load a tape using other methods.

One final note: Whenever you are not actually saving or loading a file from tape, make sure the recorder's Play button is not depressed. Leaving the Play button down causes a crimp in the tape and I/O Errors that cannot be corrected.

?*How can I verify a program save to cassette?*

Rewind the tape to the silent spot just before the newly saved program. Then enter `SKIPF`*"filename"*. This will cause the system to "read through" the saved file. If you don't get an error message, it's a safe bet you have a good save of the program. Note that this does not verify the program will run (who knows what errors lurk within the program?), but it will ensure there are no I/O errors where the program is saved.

?*What is ASCII, and how can I save a program in ASCII format?*

ASCII (American Standard Code for Information Interchange) is a text format in which each byte holds one single character. When you enter `CSAVE`*"filename"* or `SAVE`*"filename"*, the program is saved in tokenized format. In this format, BASIC keywords are saved as one-byte tokens. For example, the `PRINT` command is saved as one byte instead of five (as would be the case if the program were saved in ASCII). This tokenized format, sometimes referred to as binary or compressed format, saves space on the tape or disk. To save a program in ASCII, which is necessary in some cases (i.e. for use with the Disk BASIC `MERGE` command), put `,A` after the (C)`SAVE` command (i.e., (C) `SAVE`*"filename"*`,A`).

Disk and Drive Dilemmas

?*What are the differences in DOS versions (RS-DOS, ADOS, JDOS, etc.)? Why does* RAINBOW *call RS-DOS Disk* BASIC?

Let's look at the second question first. RS-DOS is somewhat a misnomer. It is not a true operating system that controls and monitors the operation of the Color Computer. Rather, it is a group of simple routines that allow the user to save and load programs with a disk system. Therefore, RAINBOW will refer to this pseudo-operating system by its real name, Disk Extended Color BASIC, or Disk BASIC for short.

Each alternate DOS for the Color Computer offers features not found in standard Disk BASIC. For instance, ADOS, the most popular alternative, lets you customize your CoCo by allowing you to more fully utilize 40-track drives. It can be set up to allow command entry in lowercase, and it does quite a bit more while allowing maximum compatibility with Disk BASIC. I find that most people will try several alternatives before finally choosing the DOS they feel most comfortable with.

?*Which disk controller works with which CoCo and which disk drives?*

In general, any disk drive will work with any controller. Of course, when you buy a Drive 0 system, you will receive a controller with a matched drive. The earlier Radio Shack controllers (Cat. No. 26-3029) will work on the CoCo 1. They will also work on the CoCo 2 and 3 if you use a Multi-Pak Interface to supply the 12-volts required by these controllers. However, using them on the CoCo 3 is not recommended because they are not entirely reliable at the higher clock speeds used by some software, most notably OS-9 Level II.

For general purposes, later revisions of the Radio Shack controller work equally well on any CoCo. In addition to Radio Shack's products, there are many third-party disk controllers on the market, like Disto, Performance Peripherals, Sardis Technologies, Hard Drive Specialists and J & M. In general, these controllers will work fine on any CoCo. Most incompatibility problems arise out of the differences in

now avl. See pg 69.

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the DOS used in the controller. For 100 percent compatibility, request the controller with Disk BASIC 1.1. Then choose alternate ROMs as you deem desirable.

? *What are the differences between 35-, 40- and 80-track drives? Can you mix and match them on a CoCo system?*

From a user standpoint, the difference between these drives is the amount of information they can store on one disk. A 35-track, single-sided (SS) disk can store approximately 156K. A 40-track, double-sided (DS) disk will hold 360K, and an 80-track DS drive will give you about 720K of storage. Only 35-track drives are supported under standard Disk BASIC. ADOS, a popular third-party alternate DOS, allows 40-track DS drive use. However, its use is limited even under this system since each side of the drive is accessed separately. In order to use a 40- or 80-track drive as a contiguous storage device, you need to operate in the OS-9 environment. OS-9's disk routines allow the full use of any drive system you have, and because of OS-9's modularity, you can mix and match drives on one system quite easily. You simply need to include a descriptor module for each drive on your system.

I suggest users purchase 40-track DS drives. This allows what I consider to be the greatest flexibility currently available. Under Disk BASIC, you may be able to use only 35 tracks on one side of the drive. However, these drives give you a head start if you decide to go on to OS-9. Note that while 40-track SS drives are still available, to the best of my knowledge they are no longer being manufactured.

? *Do I really need to buy a disk drive? What are the benefits?*

No, you don't have to buy a disk drive. Many users choose not to advance beyond a tape-only system, and a disk drive is a big purchase. However, owning a disk drive will make your computing life much easier and more enjoyable. A disk system is much less prone to I/O Errors, and it does not take as long to save and load programs. It is easier to keep a system of backups for important data and programs, and a disk offers a great deal of storage capacity, with data quickly retrievable. Finally, many commercial software products are not available for tape-only systems. The flexibility offered by disk drive systems is nearly a must for any serious use of the CoCo.

? *Why do I need to format a disk before I use it? How do I do this?*

When you buy a blank floppy disk for your CoCo, it is really just a piece of plastic coated with a magnetic material. If you tried to save data on this disk, the CoCo would not know where to save that data. It needs an organized way to store information on the disk. The formatting process aligns the magnetic particles in the disk's coating in such a way as to divide the disk into concentric circles called *tracks*. Each of these tracks is the same size and will hold the same amount of data. Now the CoCo has a way to organize the data it saves to disk. Using information saved along with the data, the CoCo can then load the data back in very quickly.

To format a disk using the CoCo, place the disk in Drive 0 (the only drive slot if you have only one, or the first slot on the left or the bottom slot if you have dual drives) and enter `DSKINI0`. (To format a disk in the second drive (Drive 1), type `DSKINI1`. After a few seconds, the format will be complete and you will be ready to save programs. One note of caution is in order here: The format process erases any programs you might have in memory. Therefore, make sure you have a formatted disk ready to receive your program before you start typing it in.

? *How do I back up a disk and why do I need to?*

Let's look at how to make a backup copy of a disk. First you will need to format a *destination* disk using the `DSKINI` command. The original disk that you want to

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back up is referred to as the *source* disk. If you have only one drive, place the source disk in the drive and enter `BACKUP 0 TO 0`. The drive will start, and soon you will be prompted to place the destination disk in the drive. Wait for the red light on the drive to go out before switching the disks in the drive. As the backup process continues and information is copied from one disk to the other, you will be prompted to alternately place the source, and then the destination disk, in the drive. When you see the OK prompt, the backup is complete. Now you should have two copies of the original disk.

With a two-drive system, place the source disk in Drive 0 and the destination disk in Drive 1. Then enter `BACKUP 0 TO 1`. The backup will begin. You will not be asked to switch the disks in the drives. Note that you could have placed the source disk in Drive 1 and the destination disk in Drive 0 and entered `BACKUP 1 TO 0`. It is just a matter of preference and convenience.

As our society places more and more trust in the reliability of computer systems, more people succumb to disk crashes and are forced into the realization that backing up of data is very important. Something as *minor* as an electronic glitch can render thousands of bytes of data useless almost instantly. And, as with lightning, we never know when disaster will strike. It is good insurance to back up any disks on which you have important programs and data. Always have at least two copies of these important files and store them in separate places. The exceptions to this rule are copy-protected third-party programs and quick *scrap* programs you write. In most cases, no provision is made for backup of copy-protected software. In addition, I usually have several junk disks with bits and pieces of programs on them. However, I back up any disk that is important or that I want to keep.

On a related matter, I suggest using write-protect tabs whenever possible. These are just little pieces of tape that cover the notch on the side of a disk. But they are important — they make the disk so that it cannot be written to. (If you attempt to format or save data to a disk which has been "write-protected", you will get a WP [Write Protect] Error.) I have on several occasions formatted the wrong disk and lost important data. Always be conscious of the safety of your data and programs.

?*Is there a simple way to transfer my programs from tape to disk?*

For BASIC programs, all that should be necessary is to `CLOAD` the program from tape and then save it to the disk using the `SAVE"filename"` command. Machine language programs are more challenging. If you know the start, end and execution addresses of the ML program, just `CLOADM` the program and then save it to disk by entering `SAVEM"filename ",start address, end address, execution address"`. If you don't know the addresses, you can find them by `CLOADM`ing the file and entering the following pokes to determine each address:

Start Address:

```
PRINT PEEK(487)*256 + PEEK(488)
```

End Address:

```
PRINT PEEK(126)*256+PEEK(127)-1
```

Execute Address:

```
PRINT PEEK(157)*256 + PEEK(158)
```

Once you have found this information, save the program to disk as described above.

Magnetic and Electrical Disturbances

?*What magnetic fields should I avoid with my disks and tapes?*

The idea of a computer disk — a simple piece of material capable of holding quite a bit of information — is somewhat magical. But the same magic that allows us to save information, *magnetism*, can also destroy that data. Care must be taken when storing and handling tapes and disks to ensure they do not come into contact with magnetic fields. The following guidelines will help keep your data safe from this hazard:

- Set your equipment up so that the recorder, drives and tape and disk storage boxes are placed away from the left side of the monitor. The flyback transformer is located there. Since it puts out a lot of interference, it can cause I/O Errors.
- Never place a tape or disk on top of the monitor. (Keep at least six inches away.)
- Always keep disks in their sleeves and in an upright position in a covered case. Cassettes should be kept in their boxes when not in use.
- Never touch the tape within a cassette or the actual disk media through the small oval hole in the jacket.
- Write on your disk labels *before* placing the label on the disk.
- Don't store tape and disk cases on or near the floor (vacuum cleaner motors induce magnetic fields that love to erase disks.)
- Those cute little refrigerator magnets for holding notes are wonderful, but keep them away from your computer area. It is easy to put a tape or disk on a messy desk only to find you laid it on one of those magnets.

The best way to send tapes and disks through the mail is by sandwiching them between two stiff pieces of cardboard and putting them inside a manila envelope. Some people choose to wrap the disks and tapes in aluminum foil to bounce off rays. While the appropriate people may not notice it, it sometimes helps to write "Magnetic Media — Do Not X-Ray" in bright letters on the package.

Speaking of X-rays, always ask the attendant to hand-check tapes and disks when you come to the X-ray machines at the airport. This will help you avoid any unplea-

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sant surprises when you arrive at your destination.

Finally, always keep backups — just in case. A little care and common sense goes a long way toward ensuring your computing enjoyment.

Can I use a CoCo with a 220-volt power source, like those in foreign countries?

Strictly speaking, no. The Color Computer produced for the American market is designed to run on 120 volts AC at a frequency of 60Hz. While voltage converters are readily available that will allow the operation of 120 VAC devices on 220 VAC circuits, the frequency of the supplied power in most foreign countries is 50 Hz, and frequency converters are far less common and relatively expensive. The frequency difference may not present that great a problem, but using the CoCo at the lower frequency may cause the machine to run much hotter. While I don't recommend using an American CoCo in foreign countries, there are guidelines that may allow you to do this in a safe manner. For more information on the subject, refer to "CoCoing Abroad" (November '87, Page 32) by Marty Goodman and Don Hutchison.

Hardware for Your CoCo

How many different types of printers are available for the CoCo?

Printers currently come in three basic types: dot-matrix, daisy-wheel and laser. Most flexible for CoCo users is the dot-matrix printer. It prints both graphics and text, and most newer dot-matrix printers offer letter-quality modes that give excellent printouts. The daisy-wheel printers are limited because they do not offer bit-image graphics. Laser printers are priced out of range for most CoCo users, and while they offer excellent text output in a variety of fonts, there are no commercial graphics packages available for use with the CoCo.

The discontinued Color Graphic Printer (CGP-220) from Radio Shack was great for anyone interested in graphics. It worked well with the new graphics packages for the CoCo 3. The CGP-220 was an offshoot of dot-matrix technology. Rather than driving a pin onto an inked ribbon to print a dot, this printer shoots jets of different colored ink to form dots on the page. Many newer dot-matrix printers offer color capability through the use of special ribbons. For more information about the different types of printers, see Ed Ellers' "Printer Overview," (May '88, Page 110).

How can I figure out the printer baud rate for a program?

When the Color Computer is turned on, the internal setting for printer baud rate is automatically set to its default value of 600 baud. Most CoCo-compatible Radio Shack printers have DIP-switch settings for higher values, allowing quicker printing times. It is possible, for instance, to set the Tandy DMP-130 printer to receive data at 2400 baud. In order for this to work, however, you must also set the computer's internal sending rate to 2400 baud. Failure to do this will result in *garbage* printouts. A similar situation will occur if you are using a serial-to-parallel converter and it is set to something other than 600 baud. To change the CoCo's sending rate, issue the appropriate poke from the following:

`POKE 150,1`	9600 baud
`POKE 150,7`	4800 baud
`POKE 150,18`	2400 baud
`POKE 150,41`	1200 baud
`POKE 150,87`	600 baud

These pokes work equally well from within a BASIC program or entered directly from the keyboard. Some programmers use these pokes in their programs published in THE RAINBOW. We try to make a reference to these pokes in accompanying articles. In some cases, however, you might have to search through the program for pokes to memory Location 150. When you find them, just change the poked value to the appropriate value listed. For more information on printers and how they can be used, see my article "Printer Diversions and Conversions" (August '88, Page 142).

What is an EPROM, and how do you "plug it in" and use it? Do I need to be a hacker to work with EPROMs?

The Color Computer uses two kinds of memory for its operation: RAM and ROM. RAM (Random Access Memory) can be read from as well as written to. This is the area of memory that holds the programs you type or load into the CoCo. ROM (Read Only Memory) is programmed at the factory. It holds the routines necessary for your CoCo to recognize the commands you give it. The contents of a ROM cannot be changed.

On the other hand, an EPROM (Erasable Programmable ROM) works just like a ROM except that its contents can be changed. An EPROM is an integrated circuit chip that can be *burned* with a program and then erased and reprogrammed later. Many CoCo hackers alter the contents of the original CoCo ROM, and program the new routines into an EPROM. Then they replace the original ROM in the machine with the new EPROM chip, making their changes permanent.

You don't really have to be a hacker to replace a ROM with an EPROM. Basically, all you do is pull one chip out of a socket and put in the new chip. On the CoCo 3, this is a little more difficult because the ROM is soldered to the circuit board. In this case, first desolder the ROM, replace it with a socket and then plug in the new chip. In any event, while such replacement does not require that you be a hacker, some knowledge of electronic equipment is most helpful. You should also be familiar with the precautions used to make sure you don't damage the chips. Novices would be well advised to have knowledgeable friends show them how to make the change.

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Not just another checkbook program but a user friendly, menu driven, disk based information system. Keep track of deposits, checks, ATM withdrawals and other account transactions. Define up to 36 categories to monitor expenses. Set up automatic transactions for such items as direct deposits and deductions. Balance your account(s) in minutes! Other features include multi-drive capability, display and print options, check search on any field, edit and delete capability and more.

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Reviewed in RAINBOW, February 1988.

NOVICES NICHE

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

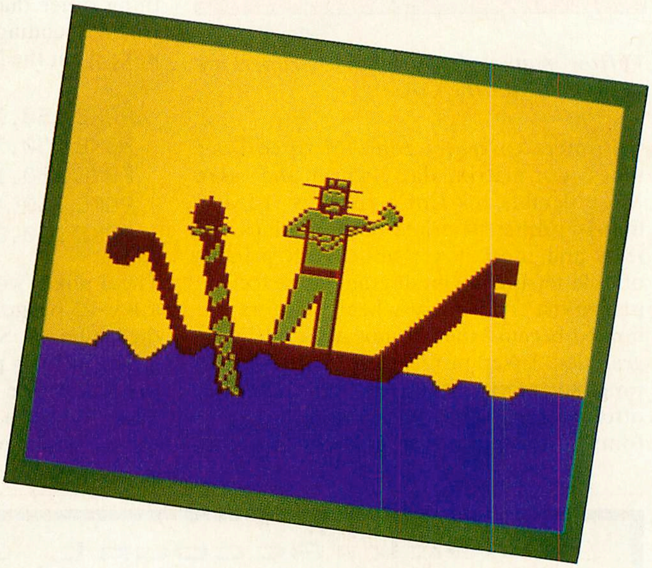
Music

Now or Never

By John Musumeci

16K
ECB

You'll think you've been transported to romantic Venice, Italy, when you load and run *Mando*. The program sketches a lovesick Romeo standing in a gondola and clutching a mandolin. After the scene is drawn and painted, the serenade begins. CoCo imitates the sound of a mandolin — you can actually hear the tremolo.



The listing: `MANDO`

```
0 'MANDO
1 '******************
2 '***** MANDO *****
3 '******************
4 '**** WRITTEN ****
5 '****** BY *******
6 '******************
7 '* JOHN MUSUMECI *
8 '******************
9 CLEAR500:CLS
10 PMODE3,1:PCLS:SCREEN1,0
11 B$="BM42,92;C4G8L5H5U5E5R15F5
M65,125;R90E50R10D10L10D5R5D10L2
0D5G30L25H5L5G5L10H5L5G5L10H5L5G
5L5M42,92"
12 P$="BM63,83;C4H3M77,77;F3M63,
83;BM66,82;M85,150;E3F3R4M74,80;
BM68,93;M75,84;BM70,97;M77,90;BM
73,108;M80,100;BM75,115;M82,108;
BM77,122;M84,113;BM80,132;M87,12
4;BM82,140;M88,130;BM85,146;M91,
138;"
13 W$="BM0,137;C4R25U2E5R5F10R5E
10BR105;R15F5R5E5R10F5R10E5R30"
14 M$="BM105,125;M115,90;U20G5R1
0BM115,65;G10D3R15BM115,65;R17BD
5D20NL17D35BM132,65;R8F3BM132,65
;BD5R10BM118,78;E3R7G3L5M118,78;
F4R3E7M150,67;F2E5H6G5F2M129,75;
BM110,125;M125,100;D25"
15 DRAW B$
16 DRAW P$
17 CIRCLE(69,74),8,4
18 DRAW W$
```

```
19 DRAW M$
20 CIRCLE(124,60),8,4:PSET(122,5
7,4):PSET(126,57,4)
21 CIRCLE(124,62),4,4,.12:DRAW"B
M117,60;F3R3E2RF3R2E2"
22 DRAW"BM110,55;R20NR7U4L10D4"
23 PAINT(2,140),3,4:PAINT(210,80
),4,4:PAINT(60,125),4,4
24 PAINT(2,2),2,4:PAINT(120,120)
,2,4:PAINT(70,85),4,4
25 PAINT(75,100),4,4:PAINT(80,11
5),4,4:PAINT(70,75),4,4:DRAW"BM1
14,93;R19":PAINT(117,91),4,4
26 PLAY"T12O3"
27 I=1
28 READ I$,Z
29 IF I$="ZZ"THEN 37
30 FOR X=1 TO Z
31 PLAY I$
32 NEXT X
33 I=I+1
34 GOTO28
35 DATA O4D,4,D,4,C#,4,O3A,8,A,1
2,O4C#,4,C#,4,O3B,4,G,20,O4C#,4,
C#,4,O3B,4,G,8,G,12,E,4,F#,4,G,4
,A,28,A,4,B-,20,G,4,O4D,4,O3B-,4
,A,20,F+,4,E,4,D,4,A,20,F+,4,E,4
,D,4,D,20
36 DATA ZZ,1
37 FORX=1TO3000:NEXTX:END
```

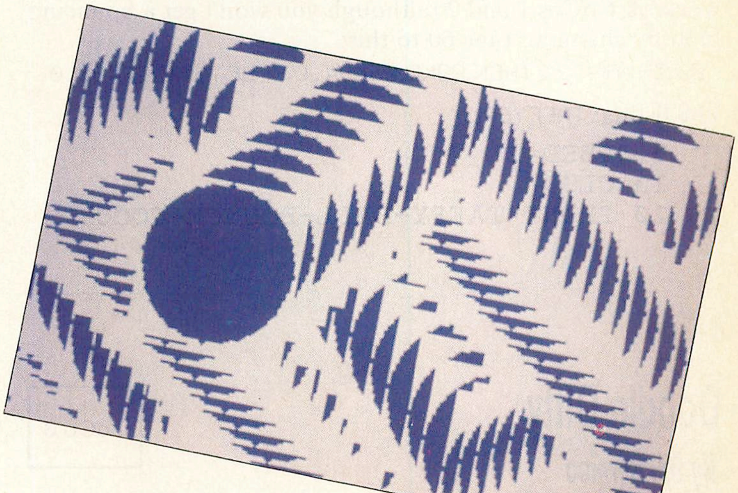
Graphics

Bouncing off the Walls

CoCo 3

By Etienne St. Jean

This short program uses the `PALETTE` command to demonstrate all 64 colors on the CoCo 3. It animates a bouncing ball that careens off the borders of the CoCo 3 screen, leaving a patterned trail behind it. The ball changes colors at each move and the background changes color when the ball touches the border.



The listing: `BALLDEMO`

```
0 '         BALL DEMO
10 '           BY
20 '     ETIENNE ST-JEAN
30 '
40 POKE65497,0
50 CLEAR1000
60 D=2:X=50
70 PALETTECMP:PALETTE1,0
80 HSCREEN2:HCIRCLE(100,100),30,
1:HPAINT(100,100),1
90 HBUFF1,1890
100 HGET(70,70)-(130,130),1:HCLS
110 M=M+1:IFM=63 THENM=0:ELSE PA
LETTE0,M
115 IFI=0 ANDD=2 THEN GOTO140 EL
SEIF I=0 ANDD=4 THEN GOTO240 ELS
EIF X=0 ANDD=1 THEN GOTO240 ELSE
IF X=0 ANDD=2 THEN GOTO290
120 IF I=255ANDD=1THEN GOTO190 E
LSEIF I=255ANDD=3THEN GOTO290 EL
SEIF X=130ANDD=4THEN GOTO190 ELS
EIF X=130ANDD=3THENGOTO140
140 Z=255
150 HPUT(I,X)-(I+60,X+60),1,PSET
155 D=1:X=X-4:I=I+6:IFX<0 THEN X
=0:ELSE IFI>255 THEN I=255
160 IFI>250 THENI=255:GOTO110
170 IFX<5 THENX=0:GOTO110
180 Z=Z-5:POKE140,Z:EXEC43345:Q=
Q+1:IFQ=63 THEN Q=0:ELSE PALETTE
1,Q:ELSE GOTO150
181 GOTO150
190 Z=255
200 HPUT(I,X)-(I+60,X+60),1,PSET
205 D=2:X=X-5:I=I-7:IFX<0 THEN X
=0ELSE IFI<0 THEN I=0
210 IF I<5 THENI=0:GOTO110
220 IF X<5 THENX=0:GOTO110
230 Z=Z-5:POKE140,Z:EXEC43345:Q=
Q+1:IFQ=63THENQ=0:ELSEPALETTE1,Q
:ELSE GOTO200
231 GOTO200
240 Z=255
250 HPUT(I,X)-(I+60,X+60),1,PSET
```

```
255 D=3:X=X+8:I=I+9:IFX>130 THEN
 X=130 ELSE IFI>255 THEN I=255
260 IFI>250 THENI=255:GOTO110
270 IFX>124 THENX=130:GOTO110
280 Z=Z-5:POKE140,Z:EXEC43345:Q=
Q+1:IFQ=63 THEN Q=0:ELSEPALETTE1
,Q:ELSE GOTO250
281 GOTO250
290 Z=255
```

```
300 HPUT(I,X)-(I+60,X+60),1,PSET
305 D=4:X=X+8:I=I-7:IFX>260 THEN
 D=260: ELSE IFI<0 THEN I=0
310 IFI<5 THENI=0:GOTO110
320 IFX>124 THENX=130:GOTO110
330 Z=Z-5:POKE140,Z:EXEC43345:Q=
Q+1:IFQ=63 THENQ=0:ELSEPALETTE1,
Q:ELSE GOTO300
340 GOTO300
```

Like Pulling Taffy

CoCo 3

By Tio Babich

Despite its apparent simplicity, this program, *TaffyBall*, will create a very smoothly animated bouncing ball — that bounces as if it's made of sticky taffy. Actually, the program gives you two options: In addition to watching the taffy ball bounce, you can watch two taffy balls revolve around each other. For fun, experiment with the "speed" valve in Line 5. The higher the number, the faster the animation. *TaffyBall* operates via timing idiosyncrasies in the CoCo 3, but it *can* work on CoCos 1 and 2 (although you won't get a bouncing ball) by changing Line 60 to this:

```
60 IF A$="2" THEN POKE 65494,0 ELSE POKE 65495,0
```

The listing: TAFFYBAL

```
5 SPEED=2
10 CLS0
20 PRINT"TAFFY-BALL-BOUNCE-COCO3
"
30 PRINT:PRINT"SELECT:":PRINT"1.
 TAFFY BALL BOUNCE
40 PRINT"2. REVOLVING BALLS"
50 A$=INKEY$:IFA$=""THEN50
60 IF A$="2" THEN POKE 65496,0 E
LSE POKE 65497,0
70 SCREEN1,1:PMODE4:PCLS1:COLOR0
90 FOR G=0 TO 1 STEP .1
100 CIRCLE (128,70),40,G,G
110 NEXT G
120 POKE 140,SPEED 'BOUNCE SPEED
130 PMODE1:SCREEN1,1
140 EXEC43345
150 PMODE3:SCREEN1,1
160 GOTO 130
```

Doodle Ditty

CoCo 3

By Bill Bernico

Doodler3 is a fun, menu-driven CoCo 3 program to take your mind off databases, spreadsheets and other seriousness for a while. Just load and run — you need no instructions. Kids will like this.

The listing: DOODLER3

```
1 'COLORFUL GRAPHICS DOODLER
       (C) 1988 FROM
    BILL BERNICO SOFTWARE

2 'A COLORFUL BREAK FROM THE
   SERIOUS SIDE OF COMPUTERS

3 ON BRK GOTO 19:RGB:HSCREEN2:HC
LS8:HCOLOR6,8:HPRINT(15,2),"THE
DOODLER":HCOLOR4,8:HPRINT(15,5),
"(1) CIRCLES":HPRINT(15,7),"(2)
SQUARES":HPRINT(15,9),"(3) DOTS"
:HPRINT(15,11),"(4) PLUSES":HPRI
NT(15,13),"(5) END
4 HCOLOR2:HLINE(110,10)-(220,140
),PSET,B:HLINE(105,5)-(225,145),
PSET,B:HPAINT(107,7),1,2:FORV=1T
O300:NEXT:PLAY"O4T60B":HCOLOR3,8
:HPRINT(15,16),"SELECT (1-5)
5 S$=INKEY$:IF S$=""THEN 5
6 IF S$="5"THEN19
7 S=VAL(S$):X=10:Y=10:Y=8:Z=2:HS
CREEN2:HCLS8:HCOLOR4,8
8 ON S GOSUB15,16,17,18
9 Q=Q+1:IFQ=84 THEN 14
10 X=X+26:IFX>299THENX=10
11 Y=Y+26:IFY>180THENY=8
12 Z=Z+1:IF Z>7THENZ=0
13 O=RND(5):N=RND(12):PLAY STR$(
O):PLAY"V30T60":PLAY STR$(N):GOT
O8
14 FORT=1TO1000:NEXTT:RUN
15 HCIRCLE(X,Y),19:HPAINT(X,Y),Z
,4:RETURN
16 HLINE(X,Y)-(X+26,Y+26),PSET,B
:HPAINT(X+2,Y+2),Z,4:RETURN
17 HCIRCLE(X,Y),1,Z:RETURN
18 HCIRCLE(X,Y),2,Z:RETURN
19 WIDTH32:END
```

Psychedelia

CoCo 3

By Alex Abraham

Let *Psycho* hypnotize you with its ever-changing tapestry of Hi-Res graphics. *Psycho* pokes the memory of the CoCo 3 into random and colorful lines. But give the program about five minutes to compose itself — first it draws itself line-by-line and then begins the metamorphosis.

The listing: PSYCHO

```
10 ' The Psychedelic Screen
20 ' By Alex Abraham
30 PALETTE 0,0
40 CLS
50 ATTR3,0
60 HSCREEN 2
70 FOR X=&H60000 TO &H67FFF
80 Y=RND(255)
90 LPOKE X,Y
100 NEXT X
110 FOR X=0 TO 15
120 Y=RND(63)
130 PALETTE X,Y
140 NEXT X
150 GOTO 110
```

Education

All Things in Progression

4K

By Keiran Kenny

Progressive Quizzer is a quizzing program that works on the Charade principle: You are given clues on a person, place or thing. If you guess the answer on the first clue, you earn the top score. If you give an incorrect answer or just press ENTER to pass, you are given another clue. This goes on until either you answer correctly or all the clues have been given. The value of the score is one more than the number of clues remaining after you guess correctly.

To mount your own quiz with subjects of your own choosing, follow my examples in the DATA lines 1000 through 2000. The identity of the first subject, Paderewski, is in Line 1000. Four clues follow, and in Line 1050 the DATA X flag marks the end of the subject. Lines 1060 through 1100 and lines 1110 through 1160 are the DATA lines for the second and third subjects.

You can have as many subjects or question "clusters" as you want. Just make sure that each block of clues is followed by DATA X, as in Line 1050, and that your final DATA line reads DATA ZZ. And, to be fair, your first clue should contain sufficient information to permit a correct guess first time up.

The listing: PROGQUIZ

```
0 'PROGQUIZ' by Keiran Kenny,
   Sydney, 1988.
10 CLS
20 QZ=QZ+1:READA$:IFA$="ZZ"THEN1
60
30 PRINT@228,"PROGRESSIVE QUIZ,
NO."QZ;CHR$(8)"."
40 PRINT:PRINTTAB(8)"PRESS ANY K
EY."
50 K$=INKEY$:IFK$=""THEN50ELSECL
S
60 READB$:IFB$="X"THENPRINT"ANSW
ER: "A$".":GOTO130ELSEN=N+1:PRIN
TB$
70 INPUTC$
80 IFC$=""THENPRINT"PASS.":GOTO6
0
90 IFC$=A$THENPRINT"RIGHT!":M=N:
GOTO100ELSEPRINT"WRONG":GOTO60
100 READB$:IFB$="X"THEN110ELSEN=
N+1:GOTO100
110 IFM=N THENP=1ELSEP=N-M+1
120 Q=Q+P:PRINT"THERE WERE"N"CLU
ES. YOU GUESSED","THE RIGHT ANSW
ER IN"M;CHR$(8)"."
130 PRINT"SCORE:"P;CHR$(8)".",,"
TOTAL SCORE:"Q;CHR$(8)"."
140 PRINT@488,"PRESS ANY KEY.";
150 K$=INKEY$:IFK$=""THEN150ELSE
CLS:N=0:M=0:P=0:GOTO20
160 PRINT@192,"END OF QUIZ. TO R
EPEAT PRESS <R>OR END PRESS <E>.
"
170 K$=INKEY$:IFK$=""THEN170
180 IFK$="R"THENRUN
190 IFK$="E"THENCLS:END
200 GOTO170
1000 DATA PADEREWSKI
1010 DATA I WAS BORN IN POLAND I
N 1860 ANDBECAME A FAMOUS PIANIS
T.
1020 DATA I LIVED IN FRANCE FOR
MUCH OF MYLIFE BUT RETURNED TO P
OLAND       AFTER WORLD WAR 1.
1030 DATA I BECAME PRESIDENT OF
POLAND IN 1919.
1040 DATA I DIED IN 1941 AND HAV
E BECOME  A SYMBOL OF THE POLISH
 PEOPLE'S STRUGGLE FOR INDEPENDA
NCE.
1050 DATA X
1060 DATA ALEXANDER
```

```
DATA I THOUGHT I HAD CONQUE
HE   WORLD AND I WEPT BECAU
ERE  WERE NO MORE WORLDS TO
UER.
1080 DATA "I WAS EDUCATED BY ARI
STOTLE AND I CONQUERED PERSIA, E
GYPT AND   INDIA.
1090 DATA LEGEND SAYS I CUT THE
GORDIAN   KNOT.
1100 DATA X
1110 DATA WASHINGTON
1120 DATA I WAS BORN IN VIRGINIA
 IN 1732  AND PLAYED A DECISIVE
ROLE IN   THE ESTABLISHMENT OF T
HE UNITED STATES OF AMERICA.
1130 DATA I LED THE AMERICANS TO
 VICTORY  AT TRENTON AND YORKSTO
WN.
1140 DATA I WAS TWICE ELECTED PR
ESIDENT OFTHE UNITED STATES.
1150 DATA I RETIRED IN 1793 AND
LIVED IN  VIRGINIA UNTIL MY DEAT
H IN 1799.
1160 DATA X
2000 DATA ZZ
```

Utilities

255 Ways to Clear Your Screen

CoCo 3

By Lee Deuell

CLS255 uses a special poke (`POKE &HF6BC,255`) to allow CoCo 3 owners to customize their 40-column screens in 255 ways. It cycles through foreground-background color combinations and even a "notebook" mode (the screen looks like a page of ruled paper). On running, just press a key to change the combinations. The listing is annotated with remark (`REM` or `'`) lines; if you want, you can delete these lines to shorten the program.

The listing: `CLS255`

```
2  'CLS 255   By Lee Deuell, (C)
 8-12-88
12  RGB:WIDTH 40
16  Y=1
20  ON BRK GOTO 44
24  POKE &HF6BC,255
28  FOR X=Y TO 255
32  CLS X
36  EXEC 44539
40  NEXT X
44  LOCATE 13,10:PRINT "This is
CLS" X;:PRINT CHR$(8);:PRINT".":
LOCATE 1,21:          PRINT "Press
 C to continue or any key to end
.
48  EXEC 44539:I$=INKEY$: IF I$=
 "" THEN 48
54  IF I$= "C" THEN Y=X + 1:GOTO
 28
```

Counting the Words

16K ECB

By Rebecca Kastack

Word Counter is a utility that counts the number of words (groups of letters bordered by spaces) in any data file you specify — for cassette users only. This program comes in handy for those times when you are required to write a paper with a word limit. If you hate counting words as much as I do, you will appreciate its talents! I designed *Word Counter* to handle data files created by *Color Scripsit II*, but it should work just as well with any other CoCo word processing file, as well as with data files you create yourself. Just type in and run the program — it works on all CoCos. It will ask you for a filename and then request that you position the tape, press Play and then ENTER. CoCo displays the contents of the files while counting the words, and then displays the total. If the program breaks with an error message, type `GOTO 60` and press ENTER. This will usually fix it. But you may run across some errors that can't be fixed that way. An FM Error means the CoCo is trying to load the wrong file. On an AO Error, type `CLOSE #-1` and start over. On an IE Error, type `GOTO 150` for a fix. With I/O Errors, you probably have a bad tape, so try turning up the volume.

The listing: `WORDCNT`

```
0 '****************************
1 '*<WORD COUNTER>
2 '*BY REBECCA KASTACK
3 '*  BOX 47,SOUTH LANCASTER
4 '*   ONTARIO,CAN. K0C 2C0
5 '****************************
10 CLS:LINEINPUT"FILENAME:";F$:I
F LEN(F$)>8 THEN 10
20 PRINT"POSITION TAPE; PRESS PL
AY"
30 PRINT"PRESS ENTER WHEN READY"
40 INPUT A
50 OPEN "I",#-1,F$
60 IF EOF (-1) THEN 150 ELSE INP
UT #-1,A$:A$=A$+" "
70 PRINTA$;CHR$(255);
80 IF LEFT$(A$,1)="." OR A$="" T
HEN 60
90 L=LEN(A$):P=1
```

```
100 I=INSTR(P,A$," ")
110 IF I=0 THEN 140
120 IF I-P>0 THEN N=N+1
130 P=I+1:GOTO 100
140 GOTO 60
150 PRINT:PRINT:PRINT "CONTAINS"
;N;" WORDS."
160 CLOSE #-1
```

Games

Hit the Slopes!

16K
ECB

By Gary Osborne

Downhill Racer is a nifty piece of "minimalist" programming that shouldn't take you long to type in. In this game you will become a skier and take on the treacherous slopes. Use your right joystick to maneuver left and right, and press the firebutton for a little "lift." 10 is a perfect score.

Downhill Racer was written on a CoCo 3 and uses the `BUTTON` command. On a CoCo 2 you will have to change Line 5 to read:

```
5 U=U+4: IF(PEEK(65280)OR128)=254 THEN U=U-4
```

If you don't like the green/black screen, then change the `SCREEN 1,0` statement to `SCREEN 1,1` in Line 3.

Yes, it *is* possible to make a "perfect 10" — but it's not easy. Then again, perfection is never easy! See ya at the bottom!

The listing: `DOWNHILL`

```
1 PCLEAR8:CLS0:PRINT@234,"downhi
ll"CHR$(128)"racer";:DIME(9):FOR
Z=1TO8:A(Z)=RND(195):PLAY"T20ECV
-":NEXT:T=0
2 FORV=1TO8:POKE1393,57-V:PMODE0
,V:PCLS:B=RND(195):C=RND(195):D=
RND(195):FORZ=0TO60STEP60:LINE(A
(V)+Z,0)-(B+Z,64),PSET:LINE-(C+Z
,128),PSET:LINE-(D+Z,191),PSET:N
EXT:PAINT(A(V)+5,0),1,1:NEXT:V=1
3 PLAY"T6V15A":U=0:PMODE0,V:SCRE
EN1,0:K=A(V)
4 FORZ=1TO2:PUT(K+20,U)-(K+26,U+
9),E,NOT:NEXT:X=JOYSTK(0):G=U:Y=
K:IFX>44THENK=K+5ELSEIFX<22THENK
=K-5
5 U=U+4:IFBUTTON(0)=1THENU=U-4
6 IFU>191THENV=V+1:IFV=9THENCLS:
PRINT"SCORE"(100-T)/10:EXEC44539
:RUNELSE3
7 IFPPOINT(K+17,U)=0ORPPOINT(K+2
7,U)=0ORPPOINT(K+17,U+9)=0ORPPOI
NT(K+27,U+9)=0THENK=Y:U=G:PLAY"T
255O1V30":FORZ=1TO30:PLAY"V-AAA"
:NEXT:T=T+5:GOTO4ELSE4
```

CoCo Pong

16K
ECB

By Brent Dingle

Here it is at last, a pong-type game for the CoCo 2 or 3. Press a key at the title or demo screen, grab a joystick, then grab a friend to compete against — or prepare for a grueling one-player match against the computer. The first one to nine wins!

The listing: `COCOPONG`

```
10 CLS:PRINT@107,"COCO PONG":PRI
NT@142,"BY":PRINT@169,"BRENT  DI
NGLE"
20 FOR Q=1 TO 1000:A$=INKEY$:IF
A$<>"" THEN 40 ELSE NEXT Q
30 PN=0:GOTO 90
40 PRINT@288,"1 OR 2 PLAYER";:IN
PUT PN:IF PN<0 OR PN>2 THEN 40
50 PRINT@288,"SPEED-UP POKE";:IN
PUT A$:IF LEFT$(A$,1)<>"Y" THEN
90
60 INPUT"COCO 2 OR 3";A:IF A<2 O
R A>3 THEN 50 ELSE IF A=3 THEN 8
0
70 POKE 65495,0:GOTO90
80 POKE 65497,0
90 N$(0)="D10R5U10L5":N$(1)="R3D
10L3R5":N$(2)="R5D4L5D6R5":N$(3)
="R5D4L5R5D6L5":N$(4)="D4R5U4D10
":N$(5)="R5L5D4R5D6L5":N$(6)="R5
L5D4R5D6L5U6":N$(7)="R5D10":N$(8
)="R5D4L5U4D10R5U6":N$(9)="R5L5D
4R5U4D10"
100 PMODE0,1:SCREEN1,1:PCLS
110 LINE(0,153)-(254,170),PSET,B
F:LINE(0,0)-(254,10),PSET,BF
120 IF PN=0 THEN DRAW"BM108,157;
C0;D10R3E2U6H2L3BR8R5L5D4R5L5D6R
5BR3U10R4D4U4R4D10BR4BU2U6E2R2F2
D6G2L2":COLOR5
130 DRAW"BM10,174;"+N$(0):DRAW"B
M238,174;"+N$(0)
140 PCOPY 1 TO 2
150 X=140:Y=RND(130)+19:MX=8:MY=
0
```

```
3:V1=20:S1=0:S2=0:V2=150
160 J0=JOYSTK(0):J1=JOYSTK(1)
170 J2=JOYSTK(2):J3=JOYSTK(3)
180 IF PN=0 THEN 250
190 V1=J1*2+10
200 LINE(6,V1)-(15,V1+15),PSET,B
F
210 IF PN=1 THEN 250
220 V2=J3*2+10
230 LINE(238,V2)-(247,V2+15),PSE
T,BF
240 GOTO300
250 IF Y<V2+3 AND V2>14 THEN V2=
V2-5:ELSE IF Y>V2+3 AND V2<133 T
HEN V2=V2+5
260 LINE(238,V2)-(247,V2+15),PSE
T,BF
270 IF PN=1 THEN 300
280 LINE(6,V2)-(15,V2+15),PSET,B
F
290 A$=INKEY$:IF A$<>"" THEN RUN
300 PSET(X,Y,1)
310 IF PPOINT(X+MX,Y)=5 THEN MX=
-MX
320 IF PPOINT(X,Y+MY)=5 THEN MY=
-MY
330 IF X<15 OR X>238 THEN GOSUB
350
340 X=X+MX:Y=Y+MY:PCOPY 2 TO 1:G
OTO 160
350 PCOPY2 TO 1:IF X<15 THEN S2=
S2+1:DRAW"BM238,174;C0;"+N$(S2-1
):DRAW"BM238,174;C1;"+N$(S2)
360 IF X>238 THEN S1=S1+1:DRAW"B
M10,174;C0;"+N$(S1-1):DRAW"BM10,
174;C1;"+N$(S1)
370 IF S1=9 OR S2=9 THEN 390
380 PCOPY 1 TO 2:SOUND 100,5:SOU
ND1,4:X=140:Y=RND(131)+19:MX=-MX
:MY=-MY:RETURN
390 IF PN=0 THEN RUN ELSE A$=INK
EY$:IF A$="" THEN 390 ELSE 90
```

Home Help

Who You Gonna Call?

16K
ECB

By Tom Rochford

Tele-Dir will run on any CoCo to keep track of your family, friends and acquaintances and all their telephone numbers. While it may be primitive programming, I find it delightfully simple and effective. The pokes in Line 10 create a borderless screen and give true lowercase in the CoCo 2. Just replace my dummy names and numbers in the DATA statements with your own names and numbers. Be sure to make your last DATA statement read XXX, as this is a dummy statement to return a "not found" message if the name is not in your program.

The listing: TELE-DIR

```
1 REM TOM ROCHFORD
2 REM 7101 CLARENDON RD #3
3 REM BETHESDA, MD 20814
10 POKE359,57:POKE65314,85
20 CLS
30 PRINT:PRINT
40 PRINT"      TELEPHONE DIRECTO
RY"
50 PRINT:PRINT
55 SOUND100,1
60 INPUT"ENTER NAME";N$
70 CLS
80 PRINT:PRINT
90 READA$
100 IFA$="XXX"THENGOTO150
110 IFA$<>N$THEN90
120 PRINT@128,STRING$(32,CHR$(17
5))
130 PRINTA$"'S NUMBER:":READA$:P
RINTA$
140 PRINTSTRING$(32,CHR$(175)):G
OTO160
150 PRINTN$" NOT FOUND--TRY AGAI
N":FORT=1TO1000:NEXTT:CLS:RESTOR
E:GOTO55
160 RESTORE
165 PRINT"PRESS <ENTER> FOR NEXT
 INQUIRY"
170 EXEC44539
180 GOTO55
190 DATA POPE JOHN,VAT-6900,MICK
EY MOUSE,543-1234,DONALD DUCK,56
6-4321,JACK RIPPER,123-4567
200 DATA HARRY HOUDINI,000-0000,
QUEEN VICTORIA,765-4321,GEORGE W
ASHINGTON,(202)555-9999
500 DATAXXX
```

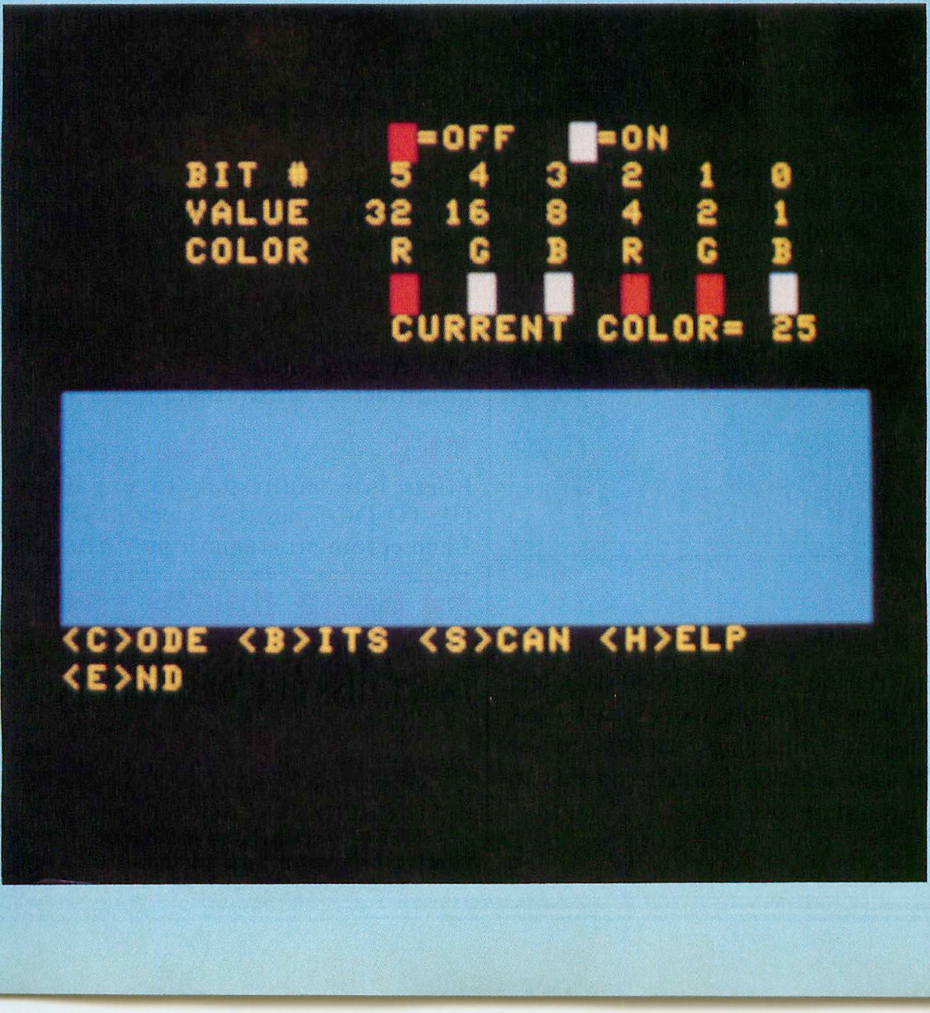
Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

Ever wondered how your RGB monitor determines colors?

An RGB Demonstration

By Dave Jenkins



```
          🟥=OFF     ⬜=ON
BIT #      5   4   3   2   1   0
VALUE     32  16   8   4   2   1
COLOR      R   G   B   R   G   B
          🟥  ⬜  ⬜  🟥  🟥  ⬜
          CURRENT COLOR= 25

<C>ODE <B>ITS <S>CAN <H>ELP
<E>ND
```

This program lets CoCo 3 owners see how colors are determined for their RGB monitors. The colors for CoCo 3's composite monitor, or television screens, are different from the colors for the RGB monitor. These colors vary because the screens have different hardware. This program is designed for the RGB monitor. While it will work with a composite monitor or TV, the colors will not be correct.

The RGB monitor uses 64 different colors, 0 to 63. Six digital bits contain this information. The RGB hardware looks at these six bits and determines which colors are *on* (bit = 1) or *off* (bit = 0). There are two bits for each of the primary colors, red, blue and green. For each color, the high-order bit represents a light shade and the low-order bit, a dark shade. All 64 available colors are created by mixing these various shades.

RGB Demo displays a block at the top of the screen that shows the number, decimal value and color represented by the bit. The color of a second block indicates whether the bit is off (a red block) or on (a white block).

Dave Jenkins, an engineer at WNIN FM/TV, has been using his Color Computer for six years.

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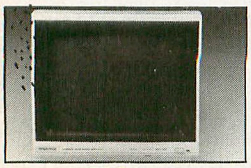
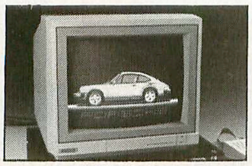


7622



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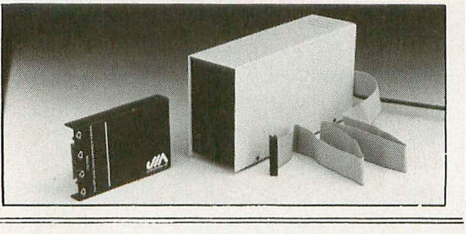

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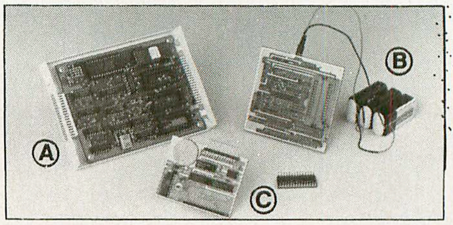

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The center of the screen shows the selected color. At the beginning of the program, the screen's center is black. All the bits for that palette are set to zero, or off.

You may enter a decimal color code (0 to 63), manipulate the bits or scan the 64 colors. To enter the decimal color code, press C and the number of the desired color. The center of the screen will change to that color. If you would prefer to manipulate the bits, press B and the number of the bits you want on. Therefore, to turn on bits three, four and five, type `B 345` and press ENTER. Bits three, four and five will be set high, and the other bits will be set low. Once again, the screen will change to the selected color. The scan mode simply displays all 64 colors in order in one second intervals. To use the scan mode, press S.

RGB Demo displays the variety of colors available on an RGB monitor. In addition, the program allows CoCo owners to manipulate these colors and better understand how the monitor creates them.

(Questions or comments regarding this program may be directed to the author at 1418 East Illinois St., Evansville, IN 47711. Please enclose an SASE when requesting a reply.) ☐

The listing: `RGBDEMO`

```
10 CLEAR300
20 ON BRK GOTO 50
30 RGB:WIDTH32:PALETTE 12,54:PAL
ETTE 13,0
40 TEST$=STRING$(192,255)
50 CL=0
60 PALETTE 7,CL
70 CLS
80 GOSUB 90:GOTO 280
90 PRINTTAB(13);CHR$(191);"=OFF
";CHR$(207);"=ON"
100 PRINTTAB(5);"BIT #    5  4  3
 2  1  0"
110 PRINTTAB(5);"VALUE   32 16  8
 4  2  1"
```

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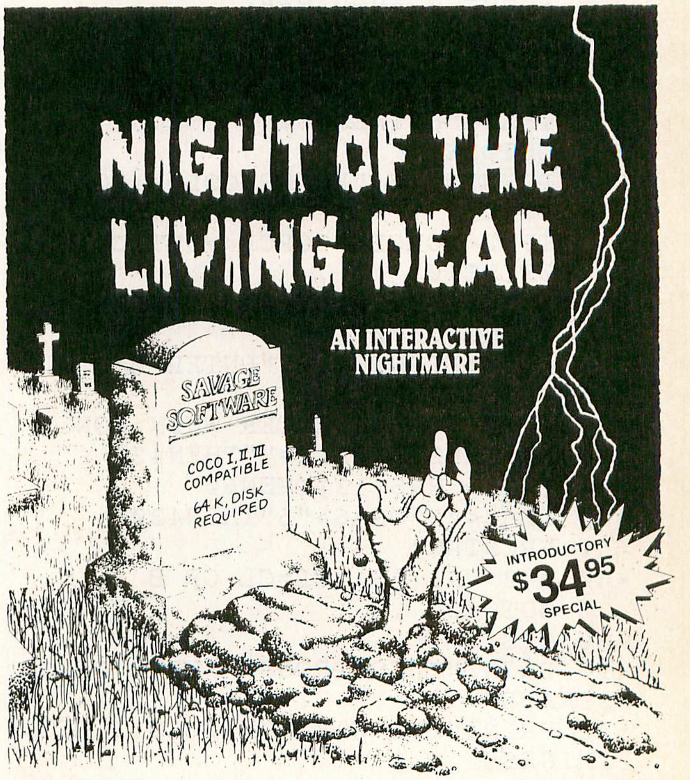

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```
120 PRINTTAB(5);"COLOR    R  G  B
 R  G  B"
130 PRINTTAB(13);
140 IFCL AND32THENPRINTCHR$(207)
;ELSEPRINTCHR$(191);
150 PRINT"  ";
160 IFCL AND16THENPRINTCHR$(207)
;ELSEPRINTCHR$(191);
170 PRINT"  ";
180 IFCL AND8THENPRINTCHR$(207);
ELSEPRINTCHR$(191);
190 PRINT"  ";
200 IFCL AND4THENPRINTCHR$(207);
ELSEPRINTCHR$(191);
210 PRINT"  ";
220 IFCL AND2THENPRINTCHR$(207);
ELSEPRINTCHR$(191);
230 PRINT"  ";
240 IFCL AND1THENPRINTCHR$(207);
ELSEPRINTCHR$(191);
250 PRINT:PRINTTAB(13);"CURRENT
COLOR="CL
260 PRINT@224,TEST$;
270 RETURN
280 PRINT@416,"<C>ODE <B>ITS <S>
CAN <H>ELP":PRINT"<E>ND";
290 A$=INKEY$:IFA$=""THEN290
300 PRINT@416,STRING$(64,32);
310 IFA$="S"THEN 820
320 IFA$="C"THEN 370
330 IFA$="B"THEN 400
340 IFA$="E"THENCLS:RGB:END
350 IFA$="H"THEN480
360 GOTO280
370 PRINT@416,"ENTER COLOR CODE"
;:INPUTCL
380 IFCL<0ORCL>63ORCL<>INT(CL)TH
EN390ELSE60
390 SOUND1,5:PRINT@416,STRING$(3
2,32);:GOTO370
400 CL=0:PRINT@416,"ENTER BIT NU
MBER TO SET HIGH"
410 PRINT"PRESS ENTER WHEN DONE"
420 A$=INKEY$:IFA$=""THEN420
430 IFA$=CHR$(13)THEN60
440 IFA$<"0"ORA$>"5"THEN420
450 PRINTA$;
460 B=2^VAL(A$):CL=CL OR B
470 GOTO420
480 CLS
490 PRINT"THIS PROGRAM WILL DEMO
NSTRATE"
500 PRINT"THE WAY THE COCO 3 DET
ERMINES"
510 PRINT"THE RGB COLORS. EACH C
OLOR CON-"
520 PRINT"SISTS OF 6 BITS, TWO B
ITS FOR"
530 PRINT"EACH PRIMARY COLOR OF
<R>ED,"
540 PRINT"<G>REEN AND <B>LUE. BY
 TURNING"
550 PRINT"A BIT ON OR OFF, YOU T
URN THE"
560 PRINT"ASSOCIATED COLOR ON OR
 OFF."
570 PRINT"THE PURE R G OR B COLO
R IS"
580 PRINT"CREATED BY TURNING BOT
H COLOR"
590 PRINT"BITS ON WITH THE OTHER
S OFF."
600 PRINT"BY TURNING ON OR OFF D
IFFERENT"
610 PRINT"COMBINATIONS OF BITS,
YOU CAN"
620 PRINT"CREATE ALL 64 COLORS A
VAILABLE."
630 PRINT:PRINT"PRESS A KEY";
640 A$=INKEY$:IFA$=""THEN640
650 CLS
660 PRINT"YOU CAN EITHER ENTER T
HE COLOR"
670 PRINT"CODE DIRECTLY BY PRESS
ING <C>"
680 PRINT"OR ENTER THE BITS YOU
WANT ON"
690 PRINT"BY PRESSING <B>. THE B
LOCK IN"
700 PRINT"THE MIDDLE OF THE SCRE
EN WILL"
710 PRINT"SWITCH TO THE COLOR YO
U SELECT."
720 PRINT"IN THE <C> MODE, SIMPL
Y ENTER A"
730 PRINT"NUMBER FROM 0 TO 63. I
N THE <B>"
740 PRINT"MODE, PRESS 0-5 TO TUR
N ON BIT"
750 PRINT"0 TO 5.  PRESS ENTER W
HEN YOU"
760 PRINT"ARE DONE AND THE COLOR
 WILL BE"
770 PRINT"DISPLAYED. THE <S>CAN
MODE WILL"
780 PRINT"DISPLAY ALL THE COLORS
 IN ORDER."
790 PRINT"PRESS A KEY"
800 A$=INKEY$:IFA$=""THEN800 ELS
E60
810 RGB:CLS:END
820 FOR CL=0 TO 63
830 PALETTE 7,CL:PRINT@0,"";
840 GOSUB 90
850 FOR DLAY=1 TO 500:NEXT
860 NEXT CL
870 CL=0
880 GOTO 50
```

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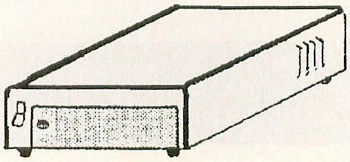

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Converting inches to feet and yards

Give 'Em an Inch

By Steve Blyn
Rainbow Contributing Editor

This month's article presents one of the many math skills taught in the middle elementary grades. Unfortunately, this particular skill is often only partially mastered by students, who must then learn it again later. Presenting this skill via a computer program should give some additional reinforcement to those who need practice to master this math problem.

The skill is to convert a number of inches into the proper number of yards, feet and inches. We encounter this skill in real life when we need to purchase material for draperies, wood for shelving or linoleum for flooring. These goods are generally sold by the foot or yard. We often measure these items in inches and then convert this measurement to yards. This program goes further by requiring that the student compute the exact number of yards, feet and inches needed from a given number of inches.

It is interesting that we are still teaching these units of measure. The metric system was supposed to become the dominant system years ago. However, it has yet to replace our familiar system of measurement. Meters and centimeters have not had the predicted impact on our system.

Our program asks the student to convert a specific number of inches into yards, feet and inches. Each example is in the form of a verbal problem because this is the most common way the lesson will be presented in school. To maintain interest in the task, the names, materials and amounts of material are chosen randomly. The random elements are selected on lines 30 to 80.

The student reads the problem and is asked to compute the number of yards included in the total amount of inches given. This is done on Line 110, as is error trapping for obviously incorrect answers. Some students will try to bomb or expose a program by entering outlandish answers. It is part of an educational programmer's job to error trap for such answers.

The student's answer is evaluated, and a correct answer is congratulated. The computer displays the correct answer and identifies the number of inches remaining after the yards are removed. The student is then asked to convert the remaining inches into feet.

The computer will again congratulate a correct answer and display the remaining number of inches. This is done to reinforce the student's understanding of the concepts. The last line displayed on the screen presents a summary for the child: The total amount of inches is converted to its corresponding amount of yards, feet and remaining inches. The child can then press ENTER to see a new example or E to end the program.

No scorecard was included in this program. To add a scorecard to the end of the program, set a constant counter at the beginning of each example and a variable counter for each correct answer. To make the program more personal for your own students, change the names or items used. As always, the Computer Island staff hopes that your children or students enjoy and benefit from our programs. ☐

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

The listing: CONVERT

```
10 REM"CONVERTING INCHES TO FEET
 AND YARDS"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1988
30 CLS5:C=36+RND(200)
40 A=RND(5):IF A=1 THEN A$="RAND
Y" ELSE IF A=2 THEN A$="JUAN" EL
SE IF A=3 THEN A$="FRED" ELSE IF
 A=4 THEN A$="CHER" ELSE A$="MAR
IE"
50 B=RND(5):IF B=1 THEN B$="CLOT
H" ELSE IF B=2 THEN B$="WOOD" EL
SE IF B=3 THEN B$="ROPE" ELSE IF
 B=4 THEN B$="TRIMMING" ELSE B$=
"WIRE"
60 PRINTA$" IS DOING A SCHOOL PR
OJECT"
70 PRINT"WHICH REQUIRES EXACTLY"
;C
80 PRINT"INCHES OF "B$"."
90 PRINT@160,"":PRINT@128,"HOW M
ANY YARDS ARE CONTAINED IN"C"INC
HES";
100 INPUT X
110 XX=INT(C/36):IF X<1 OR X>9 T
HEN 90
120 IF X=XX THEN PRINT@175,"  CO
RRECT":PLAY"L200CDEFGGG"
130 IF X<>XX THEN PRINT@174,"SOR
RY,"XX"IS RIGHT.";:PLAY"L4D"
140 FT=C-(XX*36)
150 IF XX=1 THEN Y$="YARD" ELSE
Y$="YARDS"
160 PRINT@192,C"-"XX;Y$" LEAVES"
FT"INCHES"
170 PRINT C"-"XX*36"="FT"INCHES"
180 PRINT@320,"":PRINT@288,"HOW
MANY FEET ARE CONTAINED IN "FT"I
NCHES";
190 INPUT Y
200 IF Y>2 OR Y<0 THEN 180
210 YY=INT(FT/12)
220 IF Y=YY THEN PRINT@335,"  CO
RRECT":PLAY"L200CDEFGGG"
230 IF Y<>YY THEN PRINT@334,"SOR
RY,"YY"IS RIGHT.";:PLAY"L4D"
240 LT=FT-(YY*12):IF YY=1 THEN F
$="FOOT" ELSE F$="FEET"
250 IF LT=1 THEN N$="INCH" ELSE
N$="INCHES"
260 PRINT@352,FT"-"YY;F$;" LEAVE
S"LT;N$
270 PRINT FT"-"YY*12"="LT;N$
280 PRINT@448,C"IN.="XX;"YD.,"YY
"FT.&"LT"IN."
290 EN$=INKEY$
300 IF EN$=CHR$(13) THEN RUN ELS
E IF EN$="E" THEN 310 ELSE 290
310 CLS:END
```

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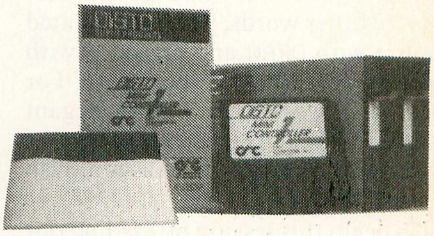

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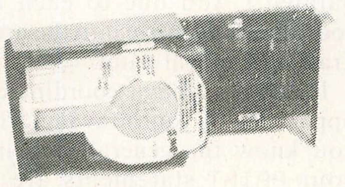

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Simplify last month's animation with GET and PUT statements

Let's GET Going

By Joseph Kolar
Rainbow Contributing Editor

You have learned how to make some animated drawings using both `DRAW` and `PAINT`, and `DRAW` and `LINE` statements. In other words, you have created a picture with `DRAW` and erased it with either `PAINT` or `LINE` statements. For this tutorial, we will try a more elegant but complicated technique that uses `GET` and `PUT` statements to accomplish this same task.

Let's begin this session by loading our faithful *Graph Paper* utility. I have decided to modify the woman's pair of shoes by making them more pointed at the tips. If you have developed your own shoe style, substitute your prints for mine in the appropriate lines of Listing 1. The shoe sizes should be 8-by-19 for the man's shoes and 6-by-15 for the woman's shoes. Use the same techniques that you used last time to make the modifications.

Using real graph paper, sketch the woman's right shoe. Use the data in Line 40 of the last tutorial as your guide. For my sketch, I decided on the following changes:

Instep: changed from `M+2,4` to `M+2,3D`
Outside of shoe: changed from `L2M-2,5` to `LM-3,-5`

This new right shoe was drawn on the screen. To see the print, add the following lines:

```
6 GOTO 400
400 PMODE4,1:PCLS:SCREEN1,0
410 GOTO 100
```

Then enter the data in Line 40 of Listing 1. (Notice that the graphics data for the shoe is not in a string variable.) Run the program.

To create the left shoe, flip over the graph paper. Add the data from lines 50 to 100 of Listing 1. After entering the data for both shoes, run the program.

We no longer require *Graph Paper*, so we will strip away everything, leaving only the pair of shoes, by entering the following:

```
DEL 0-95
DEL300-
RENUM 40,100,10
RUN
```

Now type in lines 10, 20, 30 and 1000 from Listing 1. Save those lines to tape or disk. We now have all the raw material for our *Box Step* program, and we are ready to dance.

Before we begin the animation, let's take a look at the elements involved when using `GET` and `PUT` for animation:

- We need a Hi-Res screen. The screen line should include `SCREEN1,0` to implement the appropriate screen.
- Every picture in the program series must be dimensioned near the beginning of the program. In other words, an array area must be reserved so CoCo will keep the specific, completed drawing in memory.
- We need a `DATA` statement that describes the finished form of the drawing and its screen location.
- Each drawing must be placed in a `GET` statement. This statement's format is similar to the `LINE` statement. The `GET` statement also assigns an identification variable to the drawing.
- Also similar to the `LINE` statement, `PUT` chooses a drawing by calling its variable, locates the drawing and places it on the screen. `PUT` is also used to erase the drawing.

Mask lines 30, 40 and 50 with a `REM` statement to get them out of the way, and run the program.

We must reserve a location for the man's left shoe print that is at least 16-by-38 units. It is a good practice to begin the first drawing at the coordinates (0,0). Since we began all our drawings in the upper-left corner, we are following this practice. All succeeding drawings will be made to the right of the initial drawing.

We must change the coordinates in Line 20 to (0,0). To do this, type `EDIT20` and press `ENTER`. Now use the space bar to move the cursor under the '1' in `126`. Type `2D` to delete two characters, and type `C0` to change the number 6 to 0. Use the space bar to move the cursor past the comma, and then type `2DC0` and press `ENTER`. Now run the program. Remember that the print must be drawn in the size you want shown on the screen.

Now we will paint the shoe. Use `PSET(x,y,z)` to get a location. For this tutorial, we will paint the sole of the shoe. The coordinate (4,4) is a good location, so we will add `:PAINT(4,4),1,1` to the end of Line 20. If you chose the coordinates (4,2) instead of (4,4), nothing would happen when you ran the program. (This is a clue that you are on the border of the area to be painted.) Add one to each of your coordinates to move into the area in the drawing you will paint.

It is best to paint coordinates in the upper area of your drawing. That way, you know the general area in which your `PAINT` statements are located when you are debugging your program.

The `GET` and `PUT` technique requires that the shoe be painted only once. It is then moved as if on a wash line from one location on the screen to another. Consider our earlier attempts at animation. When using our `DRAW` concatenation system, every `DRAW` statement required a `PAINT` statement as well.

Now let's unmask Line 30 and locate the man's right foot. We will place the right foot next to the left foot. We are using Size `S8` for our prints, so our entire screen area should be 16-by-38. Remember that when we use Size `S8`, we must multiply each coordinate by two to get its true screen size.

To place the man's right foot next to his left foot, we will need to unmask Line 30 and then edit it in the following manner: Use the space bar to move under B, press I and type `S8C1`. Next press `SHIFT`-up arrow, and use the space

---

Florida-based Joseph Kolar is a veteran writer and programmer who specializes in introducing beginners to the powers of the Color Computer.

bar to move the cursor under the '1' in 150. Type `D2C` to delete one character and change two others, and then type `20`. Use the space bar to move the cursor one character beyond the comma, type `2DC0` to delete two characters and change 6 to 0. Now press ENTER and run the program.

The shoes are nearly touching. Let's add a little more space between the two by beginning the right shoe at the coordinates (30,0). To do this, type `EDIT30` and press ENTER. Use the space bar to move the cursor under 2, type `C3` and ENTER. Now run the program.

The right shoe begins at (30,0) and ends at (46,38). Now let's paint its sole. To do this, pick a set of coordinates. I chose (34,4). My decision was based on the positive 4,4 offset on the other foot. If you add four to the starting coordinates, you get the coordinates (34,4). Because the shoes may not be quite symmetrical, these coordinates may not work, but they will put you in the ball park.

Where shall we locate the woman's right foot? Our man's footprints are located at (0,0) and (30,0). We will maintain the same interval for our woman's prints. That would locate the right footprint at the coordinates (60,0). Although the woman's feet are a little smaller than the man's, we will use corresponding coordinates to make our program easier to follow.

To place our woman's shoe at the appropriate location, we must edit Line 40. To do this, we must do the following: Type `EDIT40` and press ENTER. Press D to unmask the line, and use the space bar to move the cursor under the '1' of 129. Type `D2C60` to delete one character, and change the next two characters to 60. Use the space bar to move the cursor beyond the comma, and type `DC0` to delete one character and change the next one to 0. Finally, press ENTER and run the program.

Instead of painting the soles of the woman's shoes, let's paint the heels. After a few false starts, I chose the coordinates (66,2) to use in my `PAINT` statement. Before I chose the right coordinates, I tried the coordinates (63,2) and (64,2). Both resulted in washouts. Try these coordinates to see how I inched into the target area.

Since we are keeping the interval of +30 for both sets of shoes, our last shoe will be located at (90,0). To form the woman's left shoe, we must edit Line 50 in the following manner: Type `EDIT50`, press ENTER and press D to unmask the line. Use the space bar to move the cursor under B, press I to insert characters, and type `S8C1` to add size and color. Now press SHIFT-up arrow, and use the space bar to move the cursor under the '1' of 147. Now type `D2C90` to delete one character and change 47 to 90. Next use the space bar to move beyond the comma, and type `DC0` to delete one character and change the next to 0. Now press ENTER and run the program. Now let's paint the heel. I chose the coordinates (96,2) for my `PAINT` statement. Run the program to see what we have accomplished.

Now we have come to the `GET` statements. We must place each shoe in a `GET` statement. First enter Line 60 from Listing 1 and look at it. It looks similar to a `LINE` statement. The first set of coordinates are those of the upper-left corner of a specific drawing — the man's left footprint. Since we are using `S8` to define the size of the drawing, the lower-right corner of the drawing is located at the coordinates (16,38). I've added a small blank space because I am lazy and 40 is easier to use for calculations than 38. This 16-by-2 space will not affect our program adversely, but we must make sure one drawing does not overlap another. It could distort or blank out a portion of an adjacent picture.

We will assign Variable `A` to the left foot, and add `G` to the end of the statement to show that this picture must be stored in full graphic detail.

Now enter Line 61 of Listing 1. Variable `B` identifies the man's right shoe. This picture began at the coordinates (30,0) and ended at (46,38). However, don't forget that we are rounding the ending coordinates to (46,40), and remember to add `G` to the end of the line.

Enter Line 62 of the listing. I have assigned Variable `C` to the woman's right shoe print. The drawing began at (60,0) and extended down to the lower-right corner at (72,30). The shoe's area is 6-by-15, but because we chose `S8` for our size, we double the area space (12-by-30). Therefore, our end coordinates are (72,30). Don't forget to add `G` to the end of Line 62.

Finally, enter Line 63. We will assign the woman's left shoe to Variable `D`. Let's go over this line briefly. The beginning coordinates are (90,0), and the end coordinates are (102,30). Add you-know-what to the end.

At this point in our programming, we need to put in a temporary `DIM` statement. If you have a 32K CoCo, your machine should have enough memory to fully dimension each in a two-`DIM`

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array, such as A(16,40). You must dimension the same area allocated in the GET statements. In Line 60, the dimensions saved for Variable A are 16-by-40. Line 61 hold the same dimensions for Variable B. Lines 62 and 63 contain the dimensions 12-by-30 for variables C and D.

Type in Line 15. I usually place a trial, single-array DIM statement after all the GET lines are set. At that time, it's still fresh in my mind. However, before we do that, let's draw the blank area that will erase the shoes. We will begin by typing in Line 55. We'll use this line as an all-purpose erase line because it is large enough to erase all the shoes.

We will use the background color C0 on a two-color PMODE4 screen. We will use (120,0) as starting coordinates for our "erase screen." The largest item to be erased will be the man's 16-by-40-unit shoe. Next add (16,40) to (120,0) to find our ending coordinates, (136,40). Use PSET to put the coordinates on the screen, and BF to box in and paint the figure in the background color C0.

If you have a 16K CoCo and run the program now, you will get an OM Error in Line 15. We've reserved too much space in memory. For the moment, however, don't run the program. Let's just continue.

Type in Line 64. Copy the pairs of coordinates from Line 55 and put them in a GET statement. In this line, we have assigned Variable ZZ as the "erase variable," and we have ended the line with G to store all screen details in memory.

Now let's edit Line 15. Type EDIT15, and press ENTER. Now press X to go to the end of Line 15, and type X,ZZ(16,40). Press ENTER, run the program, and watch what happens. The program crashes.

Let's return to the problem line. There is a long formula that allows the use of a one-dimensional array in the place of the customary two-dimensional array. Being creative (and lazy), I will make an educated guess.

List Line 15. I chose the number 24 by random, and changed all five arrays to that single number. Retype Line 15 and replace all arrays with an array size of 24. The program line should now look like this:

```
15 DIM A(24),B(24),C(24),D(24),
ZZ(24)
```

Now run the program. If I got an FC Error in Line 100, I would know that my value was too low, and I would try another value. However, this value did work, so for now I will use it.

We can now add PUT statements to our first set of feet. To do this, we must first delete :SCREEN1,0 from Line 10 in the following manner: Type EDIT10 and press ENTER. Next, press X to move to the end of the line, and use the left arrow to move under the colon in Line 10. Press ENTER and run the program. Now press BREAK. We broke in Line 1000. Although CoCo may have drawn our prints, this is the default text screen so nothing is happening here. We will follow our program's GET statements (lines 60 to 64), with Line 80, PCLS:SCREEN1,0. After all, we don't want to see a jumbled mess; we only want to see what we call in the PUT statements.

> ***"The rule for determining array values is simple: Try a value. If it works, continue trying lower values until you find the lowest value that won't crash the computer — or stop at a usable value that you prefer."***

Now enter Line 100. This line tells CoCo to put Shoe B next to Shoe A. Note that the difference between the starting and ending coordinates is 16,40. Run the program to see the results.

Now enter lines 120 and 130, the variables for the woman's shoes, and run the program. There's a problem. Don't worry. Just change C to D in Line 120, and change D to C in Line 130. (I have been known to make mistakes.)

Now that I have a representative set of PUT statements, I can experiment with the DIM statements to see the lowest array values CoCo will accept.

In Line 15, I replaced A(24) with A(20), and it didn't work (FC Error in Line 100). So I tried a higher value, A(22). That value worked. The value A(21) worked as well. That means that arrays B and ZZ, which have the same area, can use 21 as well.

Because the woman's shoes have a smaller area than the man's shoes, I first tried the array C(18). It worked. I then began trying the following values in succession: C(14), D(12), C(11) and D(10). All these values worked. Finally, I tried C(9), but this value didn't work. (I got an FC Error in Line 62.)

Now that you know the lowest value for each pair, use those values in Line 15. (Remember: You could have used 24 for your array value and encountered no problems.)

The rule for determining these values is simple: Try a value. If it works, continue trying lower values until you find the lowest value that won't crash the computer — or stop at a usable value that you prefer.

Now enter Line 135, which is a routine that makes the program pause until you press a key. Lines 140 and 150 erase two shoes. To determine the values to put in the erase line, list the line you want to erase (e.g., enter LIST130). Type the line number for your erase line (in this case, 140), copy the first line exactly, but substitute ZZ for A. Now run the program. Don't forget to press a key, or you will wait forever.

You should now have a good idea how the program should be constructed. Without referring to Listing 2, try to complete the program. Place or remove each item — program line — one at a time, and run the program to check your progress after you enter each line.

You might want to make a diagram that includes both sets of prints in each of the four dance positions for the box step. Divide the areas for each of the four positions into four boxes, and write the coordinates for each foot in one of these boxes. This should help you to keep the feet in perspective.

If you are unable to get your shoes to dance, type in Listing 2, debug it and see how it works. Compare this listing to last month's program. Now you know two ways to animate a drawing. I think you will find the GET and PUT routine easier to use because this routine uses only the PUT command to do the work.

Well, that's it for this month. Prepare yourself for a home-grown animation project next time out. ☐

Listing 1:

```
0 'LISTING1
10 PMODE4,1:PCLS:SCREEN1,0
15 DIM A(21),B(21),C(10),D(10),Z
Z(21)
20 DRAW"S8C1BM126,136BR3R2FM+2,6
DG3M+1,4DNL4D3GL2HU4M-2,-6U2M+2,
-6E"
30 DRAW"BM150,136BR2R2FM+2,6D2M-
2,6DNL4D3GL2HU4M+1,-4H3UM+2,-6E"
40 DRAW"S8C1BM129,96BR3RFDNL3D2M
-1,3M+2,3DM-2,4LM-3,-5UM+2,-4U4E
"
50 DRAW"BM147,96BR2RFDNL3D3M+2,4
DM-3,5LM-2,-4UM+2,-3M-1,-3U3E"
55 COLOR0:LINE(120,0)-(136,40),P
SET,BF
60 GET(0,0)-(16,40),A,G
61 GET(30,0)-(46,40),B,G
62 GET(60,0)-(72,30),C,G
63 GET(90,0)-(102,30),D,G
64 GET(120,0)-(136,40),ZZ,G
80 PCLS:SCREEN1,0
100 PUT(128,96)-(144,146),A,PSET
110 PUT(148,96)-(164,136),B,PSET
120 PUT(148,56)-(160,86),C,PSET
130 PUT(130,56)-(142,86),D,PSET
135 EXEC44539
140 PUT(130,56)-(142,86),ZZ,PSET
150 PUT(128,96)-(144,146),ZZ,PSE
T
160 PUT(130,16)-(142,46),C,PSET
1000 GOTO1000
```

Listing 2:

```
0 'LISTING2
10 PMODE4,1:PCLS
15 DIM A(21),B(21),C(10),D(10),Z
Z(21)
20 DRAW"S8C1BM0,0BR3R2FM+2,6DG3M
+1,4DNL4D3GL2HU4M-2,-6U2M+2,-6E"
:PAINT(4,4),1,1
30 DRAW"S8C1BM30,0BR2R2FM+2,6D2M
-2,6DNL4D3GL2HU4M+1,-4H3UM+2,-6E
":PAINT(34,4),1,1
40 DRAW"S8C1BM60,0BR3RFDNL3D2M-1
,3M+2,3DM-2,4LM-3,-5UM+2,-4U4E":
PAINT(66,2),1,1
50 DRAW"S8C1BM90,0BR2RFDNL3D3M+2
,4DM-3,5LM-2,-4UM+2,-3M-1,-3U3E"
:PAINT(96,2),1,1
55 COLOR0:LINE(120,0)-(136,40),P
SET,BF
60 GET(0,0)-(16,40),A,G
61 GET(30,0)-(46,40),B,G
62 GET(60,0)-(72,30),C,G
63 GET(90,0)-(102,30),D,G
64 GET(120,0)-(136,40),ZZ,G
80 PCLS:SCREEN1,0
100 PUT(128,96)-(144,136),A,PSET
110 PUT(148,96)-(164,136),B,PSET
120 PUT(148,56)-(160,86),D,PSET
130 PUT(130,56)-(142,86),C,PSET
135 EXEC44539
140 PUT(130,56)-(142,86),ZZ,PSET
150 PUT(128,96)-(144,136),ZZ,PSE
T
160 PUT(130,16)-(142,46),C,PSET
170 PUT(128,56)-(144,96),A,PSET
175 EXEC44539
180 PUT(148,56)-(160,86),ZZ,PSET
190 PUT(148,16)-(160,46),D,PSET
200 PUT(148,96)-(164,136),ZZ,PSE
T
210 PUT(148,56)-(164,96),B,PSET
220 PUT(148,16)-(160,46),ZZ,PSET
230 PUT(188,16)-(200,46),D,PSET
240 PUT(148,56)-(164,96),ZZ,PSET
250 PUT(190,56)-(206,96),B,PSET
255 EXEC44539
260 PUT(130,16)-(142,46),ZZ,PSET
270 PUT(128,56)-(144,96),ZZ,PSET
280 PUT(172,16)-(184,46),C,PSET
290 PUT(170,56)-(186,96),A,PSET
295 FOR Q=1 TO 100:NEXT
300 PUT(190,56)-(206,96),ZZ,PSET
310 PUT(190,96)-(206,136),B,PSET
320 PUT(188,16)-(200,46),ZZ,PSET
330 PUT(188,56)-(200,86),D,PSET
335 EXEC44539
340 PUT(170,56)-(186,96),ZZ,PSET
350 PUT(170,16)-(184,46),ZZ,PSET
360 PUT(170,56)-(182,86),C,PSET
370 PUT(170,96)-(186,136),A,PSET
375 FOR Q=1 TO 100:NEXT
380 PUT(170,96)-(186,136),ZZ,PSE
T
390 PUT(128,96)-(144,136),A,PSET
400 PUT(170,56)-(182,86),ZZ,PSET
410 PUT(130,56)-(142,86),C,PSET
415 EXEC44539
420 PUT(190,96)-(206,136),ZZ,PSE
T
430 PUT(148,96)-(164,136),B,PSET
440 PUT(188,56)-(200,86),ZZ,PSET
450 PUT(148,56)-(160,86),D,PSET
460 EXEC44539:GOTO140
1000 GOTO1000
```

If your new year's resolution is to start programming, this is a good place to start

Learn to Walk Before You RUN

By Brian C. White

Most newcomers to computer programming look at the programs published in magazines like THE RAINBOW and wonder if they could ever write programs like those. Many people get discouraged at such marvels and give up programming altogether. This article will help you overcome some of your fears and will present a secret for which some people search for years.

Starting Out

If you are just beginning to program your lovable CoCo, start at the beginning. Find some small program that sounds interesting and type it in. A good place to look first is in the "Novices Niche" of each month's RAINBOW.

When you type in a listing, don't just copy straight from the magazine. Read each line and try to figure out what it does. If you understand what the line does, you should be able to type almost the whole line from memory. If you cannot figure out a line, watch the program in action and try to relate what is happening to what you just typed. This will help you learn more about the language in which you are programming. Once you feel confident with small programs, move up to a larger program. Keep moving up until you can tackle even the largest programs.

Remember, no matter how good you are as a programmer, you will always make mistakes. After all, you're only human. Your computer, on the other hand, is not human and will faithfully catch every typo you make. The best way to minimize errors is to understand what you are typing. That way, you are less likely to type a wrong character, because you will understand the line well enough to *know* what character belongs in that spot. Once the program is typed in and saved, run it. Unless you are some kind of super-programmer, you will get an error. (This brings us to the next section.)

Brian White currently studies electrical engineering at the University of Waterloo. He has been programming for the Color Computer for six years and teaches a local computer class.

Syntactic Errors

There are two types of errors that plague programmers. The first is the syntactic error. The syntactic error causes the familiar "Break in *xxx*" message. These errors occur because the computer has been instructed to do something it is incapable of doing. The largest problem associated with this type of error is determining *where* the error is located. When some people see a message like "Break in 90," they immediately list Line 90 and check it against the printed listing for errors. If they are unable to find a mistake in this line, they assume there is something wrong with the computer or the program and quit. Something is wrong, but it is not in Line 90. The only error that *always* occurs in the line given is the Syntax Error (?SN Error). All of the other errors can, and quite often do, originate in another line.

You may wonder how to find that line. The answer is simple: Look for it. I know, easier said than done. The best way to simplify your search for the problem is to understand what you typed. If you did that, you should have a good idea where to locate the error.

The first thing to do is to list the line giving the error and to print the values of all the variables in it. Once you find the variable that is out of range (or something like that), trace the program back to where that variable was last modified. Check for an error there. If it's not there, trace the variable back farther. Remember that variables are sometimes modified differently, depending on the values of other variables. Sometimes, you end up tracing a large number of variables around. You should not have to trace back too far because an incorrect value will usually cause an error soon after it becomes incorrect. (Remember that I said "usually," not "always.") Also, if errors based on a similar problem occur in different places, look for a subroutine called shortly before the location of error-reporting lines.

Semantic Errors

The hardest errors to track down are semantic errors. These are caused by *algorithm* mistakes. An algorithm is a step-by-step procedure for solving a problem in a finite amount of time. Semantic errors become evident during the execution of the program and are indicated by an incorrect result.

The best way to simplify the search is to understand the program as you type it in. (Funny how that last point keeps popping up, isn't it?) Again, find the variable that is giving the wrong answer and trace it back through the program. If you can figure out how the answer is different from the correct result, you might remember a routine that modified the variable in a similar or even opposite way. By checking that routine, you might find a wrong symbol, number, etc. that causes the problem. Sometimes more than one error is causing problems in the variable.

Only time will help you solve this type of problem. If the problem is in your own program, and you have narrowed it down to a specific equation, try printing the equation from the direct mode (the OK prompt) in small parts. This will help you find the part of the equation that isn't working properly. To use this method, it is essential to know what you are looking for and to understand what the equation is doing.

Programming Languages

If you have ever taken a second language — French, Spanish, Japanese or English — you have probably been told that the second language is the hardest to learn because you have no idea what similarities and differences there are among *all* languages. The same is true for programming languages.

Once you have learned BASIC, you will probably find that a second language will be harder to learn. Again, you have no idea what similarities and differences there are between the two languages, and you are tempted to try many of the things you learned in BASIC.

Read the manual on any new language before you try anything. It is the only way to really learn the new commands. You must remember commands for each language, and keep these separate from the commands of other languages because they are not interchangeable. Few commands will be the same in different languages. For instance, you are probably familiar with the `PRINT` statement in BASIC; but are you familiar with the `WRITELN` statement of Pascal, or the `PRINTF` statement of C? All three of these statements send text someplace, usually to the screen.

Once you have learned two languages, you will begin to find a common ground for all languages. The more languages you learn, the easier they will seem, and the more defined your common ground will become. It is also important to note that the languages I have described (BASIC, Pascal, and C) are similar because they are all high-level languages. You will find a low-level language, like assembly language, very different from the high-level languages, but very similar to other low-level languages. Each category of languages has its own similarities, differences and common ground.

The Envelope Please...

After all the talk of understanding what you are typing, you are probably wondering how to do it. That question is synonymous with the secret of programming. There is no magic `POKE` statement, or even a one-line program. The answer is both simpler and more complex than either of these. The answer is: *do it.*

Disappointed? Nobody said the answer would be easy, just simple. The secret of becoming a good programmer is to program. The next time you see an interesting program listed in RAINBOW, take some time and type it in. I suggest that you start small and work your way up. It doesn't really matter what you are typing, as long as you type it and understand what you are typing. Reading the listing in the magazine will not achieve the same results.

The next time you see a neat little "I need that" program, don't load it off RAINBOW ON TAPE or DISK or call up Delphi for a quick download. Sit down for a couple of minutes, hours, or days (depending upon the program's size) and type it in. That is how to start learning. The best part is that once you start learning and realize how enjoyable and rewarding it can be, you won't want to stop. You will find another "I want that" program and type it in. As long as you try to understand each line and routine as you type it in, you will find programming is not the complicated behemoth you thought it was. Rather it is a simple way of expressing yourself.

Going Beyond

If, all of your life, you learned only what your teachers told you, you would eventually know as much as your teachers, but no more. When you type in a program, you are the student, and the original programmer is the teacher. Sure, you learn some great programming tricks far more efficient than anything you have ever dreamed of trying. That's okay. Next time you write a program, you will know a better way to do something than you did before.

To go beyond this, however, you must take a hard look at the programmer's algorithms and find ways to do the same thing, better, faster and more efficiently. I'm not saying you should alter that program, but the next time you write a program of your own, you will remember the algorithm and put it in. Then, when you think your programs are good enough to be published, you become the teacher and the people typing in your program are your students. Look at all the ideas you can share through your programs at that point. Wouldn't it be disappointing to think that your knowledge couldn't be passed on to others who could take your ideas and improve upon them further?

Summary

Becoming a good programmer does not happen overnight. It takes years of dedication and a tremendous amount of time. Some of you may think you don't have the time. Maybe not, but you have enough time to learn a little. Then, you might have time to learn a little bit more. Who knows, over the course of years, you might have the time to write a best-selling program.

Programming is not as difficult as it sounds. True, it is easier for some people than for others, but you can never improve unless you try. Even the longest journey begins with one small step.

(Questions or comments about this article may be directed to the author at P.O. Box 1565, 1124 Kaposvar Dr., Esterhazy, SK, Canada S0A 0X0. Please include an SASE when requesting a reply.) □

For additional information on typing and debugging program listings, see the following tutorials and utilities, which can be found in back issues of THE RAINBOW:

- "RainbowCheck Plus" by H. Allen Curtis (February '84, Page 21 and RAINBOW Info located on Page 16 of this issue), a "check sum" system which takes a byte count of a specified number of lines of BASIC programming and then compares the byte count to the number of values assigned to the characters you type in.
- "Don't String Me Along" by Ellen and George Aftamonow (October '86, Page 100), uses a technique to track down FC (Function Call) Errors.
- "Escape From the Bug Zone" by Eugene Vasconi (January '87, Page 58), minimizes various programming bugs due to typing errors and increases programming expertise.
- "Yakety-Yak the CoCo Talks Back" by Bob Roberts (October '87, Page 106), a debugging utility that uses the Speech/Sound Cartridge to read BASIC program listings.
- "Starting From Scratch" by Lauren Willoughby (January '88, Page 20), tips for the new Color Computer user typing in BASIC program listings.

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*

Comparisons made easy

Where's the Logic?

By Fred B. Scerbo
Rainbow Contributing Editor

Recently, educational critics have placed a great deal of emphasis on standardized test scores. Students going through high school today must face PSATs, SATs, ACTs, CATs and a multitude of other T's. One thing all these tests have in common is their use of analogy.

Unfortunately, analogies are not that easy to teach. They are more a testing mechanism that measures reasoning and logic skills than a tool you can use in your everyday life. Still, the politicians demand that teachers prepare students to make high scores on the tests, for funding depends on student scores.

To help us deal with this pressure, I have written *Analogies*, a BASIC program that will help to both train and test a student in the use of analogies.

What Is an Analogy?

At some point in your education, you must have faced an analogy test of some kind. An example of an analogy might appear like the following:

Dog is to cat
as
Cat is to mouse

The relationship between a dog and cat is the same as the relationship between a cat and mouse. Both involve a superior enemy and its prey.

The following is an an example of another analogy, which is more difficult to identify because it links a concept with an individual:

Knowledge is to genius
as
Ignorance is to idiot

We may wonder how we can teach such concepts. The only way to teach analogies is through examples. Vocabulary terms can be listed and compared in analogies. What is needed is an easy way to present these concepts.

Enter *Analogies*: The Program

The program *Analogies* will run on a 16K Extended Color BASIC machine. It is designed to come up with a multitude of analogies and false comparisons. There is no limit to the different combinations it can generate, since the 48 examples can be paired in any number of random ways.

Although the program is quite simple, the subroutines have a bit of style to them. I have even included a subroutine that recognizes a beginning vowel or vowel sound, and the appropriate use of *an*, rather than *a* as the article.

There are six categories of analogies from which the program will choose questions. They are as follows:

Object and Action
Tenses
Homonyms
Parts and Whole
Synonyms
Antonyms

Let me give you some examples. In the Object and Action category, we are told that "button is to push" as "lever is to pull." A button (object) is pushed (action), and a lever is pulled.

In the Parts and Whole category, we see that "minute is to hour" as "month is to year." The first word is a part of the larger whole, represented by the second word.

I am sure you are beginning to see what I mean.

Running the Program

When you use this program, type `RUN` to get the title screen. Start the program by pressing ENTER. You will be presented with the first example and four possible answers, A through D. Simply press the letter of your choice.

Once you have made your choice, the program will indicate whether you were correct or incorrect. In either case, a flashing arrow will appear next to the correct choice.

Pressing ENTER again will bring up the next screen. If your choice was incorrect, the program explains why the answer was incorrect and shows you an explanation of the correct analogy. A correct response shows only an explanation of the correct relationship between the two statements.

Any time you are in an example, you can go to the score card by pressing @. As with all my other educational programs, you can continue where you left off by pressing C to continue.

That's all there is to it.

Changing the Program

All the examples are listed in the data at the end of the program. There can only be eight sets in each of the six categories. You can change anything in the set by typing your own examples, making them easier or more difficult.

You can create a new category, but then you must change the data in Line 85 affected by this change. (For example, if you wanted to delete the homonyms category, you would have to change the data `SOUNDS JUST LIKE`.)

Conclusion

This program opens up a new world of educational opportunities for your CoCo. If you have an idea that is educational in nature, feel free to contact me with your suggestion. It may provide the spark that helps me create a whole new type of software. See you next month. ☐

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

50	6	410	29
120	191	1030	60
240	149	4020	209
325	72	END	26

The listing: ANALOGY

```
1 REM****************************
2 REM*    QUIZ ON ANALOGIES     *
3 REM*    QUICK WRITING AID     *
4 REM*    BY FRED B. SCERBO     *
5 REM*    60 HARDING AVENUE     *
6 REM*  NORTH ADAMS, MA 01247   *
7 REM****************************
8 CLEAR2000
9 CLS0
10 PRINTSTRING$(32,140)STRING$(3
2,156)STRING$(32,188);
15 FORI=1TO160 :READ A:PRINTCHR$
(A+128);:NEXT
20 PRINTSTRING$(32,179)STRING$(3
2,147)STRING$(32,131);
25 DATA46,44,44,42,43,,45,37,44,
44,45,36,46,,,37,44,44,45,37,44,
44,42,45,40,45,44,44,42,46,44,45
30 DATA42,,,42,46,43,37,37,,,37,
,42,,,37,,,37,37,,,32,37,,,37,,,,
42,,
35 DATA46,44,44,42,42,36,47,37,4
4,44,45,,42,,,37,,,37,37,,44,42,
37,,37,44,40,,44,44,45
40 DATA42,,,42,42,,37,37,,,37,,4
2,,33,37,,,37,37,32,,42,37,,37,,
,34,34,,37
45 DATA44,,36,40,44,32,44,36,40,
,44,36,44,44,44,36,44,44,44,36,4
4,44,40,44,40,44,44,44,40,44,44,
44
50 PRINT@390," QUIZ ON ANALOGIES
 ";
55 PRINT@422," BY FRED B. SCERBO
 ";:PRINT@454," COPYRIGHT (C)198
8 ";
60 X$=INKEY$:IFX$<>CHR$(13)THEN6
0
65 CLS0
70 DIM A$(8,2,6),B(4),S(4),C(8),
D(4),R$(7)
75 FORI=1TO7:READ R$(I):NEXT
80 FORI=1TO6:FORZ=1TO8:FORY=1TO2
:READ A$(Z,Y,I):NEXTY,Z,I
```

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```
85 DATA IS SOMETHING YOU,IN THE
PAST TENSE IS,SOUNDS JUST LIKE,I
S PART OF A,MEANS THE SAME AS,IS
 THE OPPOSITE OF,IS PART OF AN
90 X=RND(8)
95 Y=RND(6)
100 FX=0:GOSUB105:GOTO120
105 CLS:PRINT@64," CHOOSE THE LE
TTER WHICH BEST     COMPLETES THE
 ANALOGY BELOW:":PRINT
110 PRINT"     "A$(X,1,Y)" IS TO
"A$(X,2,Y)"...AS":PRINT
115 RETURN
120 FORI=1TO3:B(I)=0:NEXT:FORI=1
TO3
125 YZ=RND(-TIMER):B(I)=RND(6):I
F B(I)=Y THEN125
130 NEXTI:B(4)=Y
135 FORI=1TO8:C(I)=0:NEXT
140 FORI=1TO4
145 S(I)=RND(4):IF C(S(I))=1THEN
145
150 C(S(I))=1:NEXT
155 FORI=1TO8:C(I)=1:NEXT
160 FORI=1TO4
165 D(I)=RND(8):IFC(D(I))=0THEN1
65
170 IF D(I)=X THEN165
175 C(D(I))=0:NEXT
180 GOSUB185:GOTO205
185 FORI=1TO4
190 PRINTTAB(4);CHR$(64+I)") "A$
(D(I),1,B(S(I)))" IS TO "A$(D(I)
,2,B(S(I)))
195 NEXT
200 RETURN
205 X$=INKEY$:IFX$=""THEN205
210 IF X$="@"THENGOSUB435
215 XX=ASC(X$):XX=XX-64:IFXX<1TH
EN205
220 IFXX>4THEN205
225 IFB(S(XX))=Y THEN 240
230 IR=IR+1:PRINT:PRINT" SORRY,B
UT THAT IS NOT CORRECT!"
235 GOTO245
240 CR=CR+1:PRINT:PRINT" VERY GO
OD, YOU ARE CORRECT !"
245 PRINT:PRINT" PRESS <<ENTER>>
 TO CONTINUE !"
250 FORK=1TO4:IFS(K)=4 THEN W=K
255 NEXTK
260 PRINT@192+(W*32)," =>";
265 FORKK=1TO100:NEXTKK
270 X$=INKEY$:IFX$=CHR$(13)THEN2
85
275 PRINT@192+(W*32),"   ";
280 FORKK=1TO100:NEXTKK:GOTO260
285 IF B(S(XX))=Y THEN340
290 CLS:PRINT@32," IN THE FOLLOW
ING ANALOGIES....":PRINT:PRINT@1
08,A$(X,1,Y)
```

```
295 LL$=A$(X,2,Y):IFY<>4THENQ=0:
GOTO305
300 GOSUB395
305 PRINTTAB(7)R$(Y+Q):PRINTTAB(
12)A$(X,2,Y)
310 PRINT:PRINTTAB(12)"WHILE":PR
INT
315 LL$=A$(D(XX),2,B(S(XX))):IFB
(S(XX))<>4THEN325
320 GOSUB395
325 PRINTTAB(12)A$(D(XX),1,B(S(X
X))):PRINTTAB(7)R$(B(S(XX))+Q):P
RINTTAB(12)A$(D(XX),2,B(S(XX)))
330 PRINT:PRINT" PRESS <<ENTER>>
 TO CONTINUE !"
335 X$=INKEY$:IFX$<>CHR$(13)THEN
335
340 CLS:PRINT@32,"  IN THIS CORR
ECT ANALOGY....":PRINT:PRINT@108
,A$(X,1,Y)
345 LL$=A$(X,2,Y):IFY<>4THENQ=0:
GOTO355
350 GOSUB395
355 PRINTTAB(7)R$(Y+Q):PRINTTAB(
12)A$(X,2,Y)
360 PRINT:PRINTTAB(12)"WHILE":PR
INT
365 LL$=A$(D(W),2,Y):IFY<>4THENQ
=0:GOTO375
370 GOSUB395
375 PRINTTAB(12)A$(D(W),1,Y):PRI
NTTAB(7)R$(Y+Q):PRINTTAB(12)A$(D
(W),2,Y)
380 PRINT:PRINT" PRESS <<ENTER>>
 TO CONTINUE !"
385 X$=INKEY$:IFX$<>CHR$(13)THEN
385
390 GOTO90
395 LF$=LEFT$(LL$,1):IF LF$="A"T
HEN430
400 IF LF$="E"THEN430
405 IF LF$="I"THEN430
410 IF LF$="O"THEN430
415 IF LF$="U"THEN430
420 LF$=LEFT$(LL$,2):IF LF$="HO"
THEN430
425 Q=0:RETURN
430 Q=3:RETURN
435 CLS:PRINT:PRINT:PRINT
440 PQ=CR+IR:IF PQ=0THEN PQ=1
445 PRINT"     NUMBER CORRECT = "
CR
450 PRINT
455 PRINT"     NUMBER WRONG    = "
IR
460 PRINT:PRINT"     STUDENT SCOR
E  = ";INT(CR*100/PQ);"%"
465 PRINT:PRINT"     ANOTHER TRY
(Y/N/C)";
470 W$=INKEY$:IF W$=""THEN470
475 IF W$="C"THEN FX=1:GOSUB105:
```

```
GOSUB185:RETURN
480 IF W$="Y" THEN RUN
485 IF W$="N" THEN CLS:END
490 GOTO470
1000 REM OBJECT-ACTION
1010 DATA HORSE,RIDE
1020 DATA CAR,DRIVE
1030 DATA PLANE,FLY
1040 DATA BUTTON,PUSH
1050 DATA LEVER,PULL
1060 DATA SPOON,STIR
1070 DATA BALL,BOUNCE
1080 DATA BOOK,READ
2000 REM TENSES
2010 DATA COME,CAME
2020 DATA SING,SANG
2030 DATA SPEAK,SPOKE
2040 DATA SEE,SAW
2050 DATA DIG,DUG
2060 DATA RUN,RAN
2070 DATA FLY,FLEW
2080 DATA WASH,WASHED
3000 REM HOMONYMS
3010 DATA HEAR,HERE
3020 DATA SEE,SEA
3030 DATA TEA,TEE
3040 DATA BUY,BY
3050 DATA TWO,TOO
3060 DATA ONE,WON
3070 DATA PEACE,PIECE
3080 DATA EIGHT,ATE
4000 REM PARTS & WHOLE
4010 DATA MINUTE,HOUR
4020 DATA HOUR,DAY
4030 DATA DAY,WEEK
4040 DATA WEEK,MONTH
4050 DATA MONTH,YEAR
4060 DATA SLICE,PIE
4070 DATA TREE,FOREST
4080 DATA CELL,ORGANISM
5000 REM SYNONYMS
5010 DATA HAPPY,GLAD
5020 DATA DULL,BORING
5030 DATA SILLY,FOOLISH
5040 DATA LOUD,NOISY
5050 DATA FAR,DISTANT
5060 DATA SAD,DEPRESSED
5070 DATA WASH,CLEAN
5080 DATA DIRTY,SOILED
6000 REM ANTONYMS
6010 DATA NIGHT,DAY
6020 DATA UP,DOWN
6030 DATA RIGHT,LEFT
6040 DATA PEACE,WAR
6050 DATA EMPTY,FULL
6060 DATA DIRTY,CLEAN
6070 DATA LONG,SHORT
6080 DATA FAST,SLOW
```

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* * * * * * *

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BASICally Q&A Speaking

By Bill Bernico
Rainbow Contributing Editor

Saving Graphics

Dear Bill:

How can I save a CoCo 3 picture to disk?

Bernard Robichaud
Moose Jaw, Saskatchewan

Graphics is my favorite part of computing. Let's begin with saving CoCo 3 graphics files to disk. I know two methods; perhaps other readers can offer alternative solutions.

We have an interesting trade here. One method is much faster — the whole process takes two or three seconds — but takes up four 4-gran files (16 grans total) to save a single screen. The other method, on the other hand, takes almost two minutes but needs only two grans to save and load the screen.

The first method, discussed by Richard Esposito in his January '87 column (Page 167), uses the following two routines:

Save Routine

```
10 INPUT"NAME:";N$
20 FOR I=&H70 TO &H73
30 POKE &HFFA2,I
40 F$=N$+"/HR"+CHR$(I-64)
50 SAVEM F$,&H4000,&H5FFF,44539
60 NEXT I
70 POKE &HFFA2,&H7A
```

Load Routine

```
10 INPUT"NAME:";N$
20 INPUT"HSCREEN#";H
30 HSCREEN H
40 FOR I=&H70 TO &H73
50 POKE &HFFA2,I
60 F$=N$+"/HR"+CHR$(I-64)
70 LOADM F$
80 NEXT I
90 POKE &HFFA2,&H7A
```

This procedure will make four saves, each one saving one-fourth of the screen with the extensions `/HR1`, `/HR2`, `/HR3` and `/HR4`. The procedure is effective and fast, but it is memory-consuming.

The second — slower — method is the one I use in my *Building Blocks* program (see Page 28). It looks like this:

Save Routine

```
10 INPUT"NAME:";N$
20 HSCREEN 2
30 OPEN"D",#1,N$+"/BB3",80
40 FIELD#1,80, AS, L$
50 PT=1:FOR Y=2 TO 158 STEP 4
60 D$=":"FOR X=2 TO 319 STEP 4
70 D$=D$+CHR$(HPOINT(X,Y))
80 NEXT X:LSET L$=D$:PUT#1,PT
90 PT=PT+1:NEXT Y:CLOSE
```

Load Routine

```
10 INPUT"NAME:";N$
20 HSCREEN 2
30 OPEN"D",#1,N$+"/BB3",1
40 FIELD#1,1 AS L$
50 PT=1:FOR Y=2 TO 158 STEP 4
60 FOR X=2 TO 319 STEP 4
70 GET#1,PT:PT=PT+1
80 HPAINT(X,Y),ASC(L$),8
90 NEXT X,Y:CLOSE
```

In this particular example, I've used `/BB3` as my extension. Use something else if you like. Also, in my load routine, Line 80 paints in to a black border by specifying an '8' at the end. *Building Blocks* has a screen full of small black lines that make up the picture. This is why Line 80 uses `PAINT` instead of `HSET` for those areas. If you want, you could modify the save and load portions, omitting the `STEP 4` line endings, and changing `HPAINT` to `HSET` to save a screen without the black boxes.

Easy as ABC

Dear Bill:

I'm working on a program that has 26 possible menu choices (one for every letter of the alphabet). I'm including program lines for every possible outcome, but it's taking up a lot of space. I have 26 lines that read as follows:

```
200 IF A$="A" THEN 300
201 IF A$="B" THEN 310
```

(And so on, and so on.) It's getting awfully long and tiresome. There has to be an easier way. Can you help?

Leon Danby,
Natick, MA

I think I can save you some room, Leon, if you'll use one of the two methods described here. A command that you don't see used very much, called `INSTR`, is used to locate a substring within a larger string. Let me explain how you can use it. If the place in your program where the user chooses one of the letter options begins at Line 200, the `INSTR` command would be used in this manner:

```
200 PRINT"CHOOSE A LETTER (A-Z)
210 A$=INKEY$: IF A$=""THEN 210
220 AL="ABCDEFGHIJKLMNOPQRST
UVWXYZ"
230 ON INSTR(AL$,A$) GOTO 300,310,320,
330,340,350,360,370,380,390,
400,410,420,430,440,450,460,
470,480,490,500,510,520,530,
540,550
240 GOTO 210
300 (outcome of Answer A here)
310 (outcome of Answer B here)
320 (outcome of Answer C here)
(etc.)
```

If, when using this method, the user presses C, the program branches off to Line 320. It's much shorter and more efficient than having 26 separate lines to handle 26 different answers.

Look at Line 210 in this example. The statement `A$=INKEY$` temporarily stores the answer to the key that is pressed in `A$`. When the program gets to the `INSTR` command in Line 230, it

---

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.

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WHAT TO WRITE: We are interested in what you may wish to tell our readers. We accept for consideration anything that is well-written and has a practical application for the Tandy Color Computer. If it interests you, it will probably interest lots of others. However, we vastly prefer articles with accompanying programs which can be entered and run. The more unique the idea, the more the appeal. We have a continuing need for short articles with short listings. These are especially appealing to our many beginners.

FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included on the tape or disk using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

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For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

Please do not submit material currently submitted to another publication.

---

searches the longer string (in this case `AL$`) for the contents of `A$`. When it finds that string, it branches off accordingly.

There is a second method, just as effective and just as short. Just choose the one you prefer. To make this second method effective, you must work with ASCII values in the menu selection. The example I used earlier would now look something like this:

```
200 PRINT"CHOOSE A LETTER (A-Z)
210 A$=INKEY$:IF A$=""THEN 210
220 A=ASC(A$)
230 IF A<65 OR A>90 THEN 210
240 ON A-64 GOTO 300,310,320,330,
340,350,360,370,380,390,400,
410,420,430,440,450,460,470,
480,490,500,510,520,530,540,
550
250 GOTO 210
300 (outcome of Answer A here)
310 (outcome of Answer B here)
320 (outcome of Answer C here)
(etc.)
```

Let me explain what's happening here. Lines 200 and 210 are identical to the `INSTR` example. However, since each character has an ASCII value, we need to transfer the contents of `A$` into a numerical ASCII value. That's done in Line 220. Now, whenever you press one of the letter options, its ASCII value is put into Variable `A`. For example, if you choose B from the menu, the number 65 (the ASCII value of B) is put into Variable `A`.

Line 230 checks to see if you press any key other than a letter. Since A has a value of 65 and Z, a value of 90, any selection less than A or greater than Z will not be accepted. Line 240 subtracts 64 from your value and goes through the list, branching off to the appropriate line number. We subtract 64 from the selected value so that your `ON-GOTO` routine can count from one to 26, instead of from 65 to 90, when looking for the correct branch.

Automatic Repeat

Dear Bill:

I know how to use the `INKEY$` *command by itself, but is there a way to make it repeat itself without constantly pressing a key?*

Matt Clayton,
Cleveland, OH

Good question, Matt. I know of two ways to accomplish this task. I hope one of them works the way you want in your program. Both procedures involve poking values in order to make the computer do something it wouldn't otherwise do. To get the `INKEY$` function to repeat itself, you'll have to do something like the following:

```
10 CLS
20 A$=INKEY$:IF A$""THEN 20
30 FOR X=338 TO 345:POKE X,255:
NEXT X
40 PRINT A$;
50 GOTO 20
```

Without Line 30, the `INKEY$` function will work as usual. Line 30 convinces the computer that the key has been pressed again for as long as you hold it down. If you hit the key very quickly and let it up again, you may be able to get just one character to display, but the repeat function is almost immediate.

The second way to accomplish this same task is to poke two values into the computer *before* the `INKEY$` command. The routine would look like this:

```
10 CLS
20 POKE 341,255:POKE 342,255
30 A$=INKEY$: IF A$=""THEN 20
40 PRINT A$;
50 GOTO 30
```

You'll notice that Line 30 goes back to Line 20 instead of the `INKEY$` command in Line 30. In other words, you have to poke those values each time you want the repeat feature. If you incorporate this technique into a graphics program, you can use it to make a gun shoot repeating shots, use it to advance numbers on the screen, or perhaps use it to speed up your graphics screen cursor and move objects all over the screen much faster.

Questions about specific BASIC programming problems can be addressed to BASICally Speaking, THE RAINBOW, P.O. Box 385, Prospect KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. We are unable to answer letters individually.

For a quicker response, your questions may also be submitted through RAINBOW's CoCo SIG on Delphi. From the CoCo SIG>prompt, type `ASK` for "Ask the Experts." At the EXPERTS>prompt, select the "BASICally Speaking" online form, which has complete instructions.

Results from July's programming contest

We Have a Winner!

By Bill Bernico
Contest Judge

A programming contest was announced in the July '88 anniversary issue ("Set Your Wheels to Spinning," Page 48), which gave RAINBOW readers a chance to finish a program I started. My original "core program" contained three spinning dials, numbered from one to eight. While the "core" stopped the dials on random numbers, the objective was to add to the program, making it more complete.

All the entries are in, and the winners have been selected. Although deciding who would take second, third, and fourth through tenth places was difficult, selecting the first-place winner was a snap.

Well, maybe not a snap. I had a problem there, too. The winning entry was submitted by Don Stickles from Northboro, Massachusetts, who sent in four entries, each one a winner in its own right. The hard part was deciding which of his four entries would be the grand prize winner. I was delighted by each one of his four entries, but I chose *Ring the Bell* as the winner. Don will receive a subscription to both THE RAINBOW *and* RAINBOW ON TAPE or DISK. Don's program is included with this article.

Second place was captured by Milt Poulos of Bound Brook, New Jersey, for his entry *Times Table*. For his efforts, Milt wins a year's subscription to RAINBOW Magazine. Congratulations, Milt.

Third place goes to a fellow Wisconsinite, Kathy Rumpel of Arcadia, for her entry *CoCo Lotto*. Kathy's prize is a collection of 150 of my best programs called *Special Pack*. Every one of these winners presented fine entries.

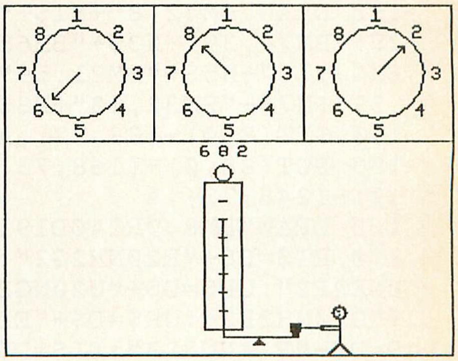
The following readers placed fourth through tenth in the contest and will receive a disk with 25 of my best programs:

Derek Snider of Scarborough, Ontario, for *Spinning CoCo Slots*
Brent Dingle of Norwalk, Iowa, for *Chance Addition*
Hollen Seay of Dacatur, Alabama, for *Crazy Ball*
Domingo Martinez of Miami, Florida, for *Roman Numeral*
*Frank Sanders, for *Spokes of Fortune*
Daniel and Maurice LeDuc of St. Antoine des Laurentides, Ontario, for *Dial a Buck*
*Patrick Uzan, for *Tri-Dial Nomial*

*Frank and Patrick, please contact THE RAINBOW. We need your addresses in order to send your prizes.

Congratulations to all of you. Your efforts made my task both difficult and rewarding.

Let me tell you a little about the winning program. It is a simulation of the carnival game in which you try to ring the bell by pounding a fulcrum with a mallet. As in my original — core — program, you are presented with three dials. Pressing 1 will stop the first dial from spinning. Pressing 2 stops the second dial, and pressing 3 stops the third dial. Each dial will stop on a random number from one to eight.



These three numbers are then displayed on the graphics screen. They represent the *strength* with which you have swung your mallet when trying to ring the bell. Pressing the space bar after each attempt allows you to try again. Although simple, the program is entertaining.

Congratulations to all of you for some fine programming. I offer my thanks to all those who entered. ☐

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.

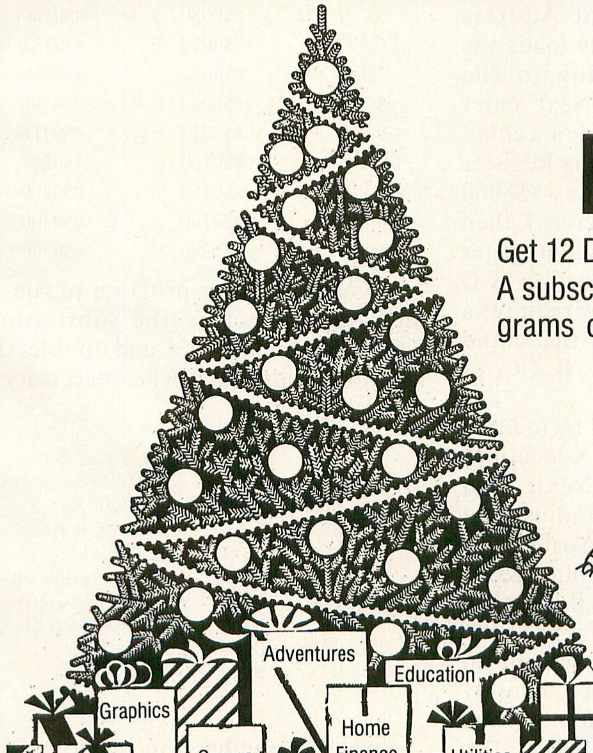
130	137
250	249
360	195
480	4
580	180
END	40

The listing: RINGBELL

```
10 'BASIC PROGRAMMING CONTEST
   WINNER..."RINGBELL"
20 'by Bill Bernico
30 'AND Don Stickles

50 CLEAR1000:DIM A(12,12)
60 D$="BM=H;,=V;":X$="BM=X;,=Y;"
70 N1$="BR3R2U6NGD6R2":N2$="BR3B
U5ER2FDGL2GD2R4":N3$="BR3BU5ER2F
DGNLFDGL2NH":N4$="BR6U6G3R4":N5$
="BR3BUFR2EU2HL3U2R4":N6$="BR3BU
3R3FDGL2HU4ER2":N7$="BR3BU6R4DG3
D2":N8$="BR4HUER2EUHL2GDFR2FDGNL
2"
80 AA$="BR6U2NR3U3ER2FD5":BB$="B
R6NLU3NR2U3NLR2FDBD1D2GNLBR":CC$
="BR6BR4BU1GL2HU4ER2FBD5":EE$="B
R6BR4L4U3NR3U3R4BD6":PP$="BR6U6R
3FDGL2BR3BD3"
90 RR$="BR6U6R3FDGL2F3BR":SS$="B
R6NHR2EUHL2HUER2FBD5":LT$="BR2H4
E4BD7":GT$="BR3BDE4H4":NO$="BR12
U2NLNR3U2NLNU2R2NU2NRD4"
100 PMODE4,1:PCLS1:SCREEN1,1:COL
OR0,1:ON BRK GOTO800
110 DRAW"BM8,0R80D73L80U73"
120 CIRCLE(48,36),25
130 DRAW"BM42,8"+N1$+"BM64,17"+N
2$+"BM74,39"+N3$+"BM65,59"+N4$+"
BM43,70"+N5$+"BM21,59"+N6$+"BM12
,39"+N7$+"BM22,18"+N8$
140 GET(8,0)-(88,73),A
150 PUT(88,0)-(168,73),A:PUT(168
,0)-(248,73),A
160 DRAW"BM8,0R240D191L240U191
170 RI$=D$+"R20NH2G2":LE$=D$+"L2
0NE2F2":UP$=D$+"U20NG2F2":DO$=D$
+"D20NH2E2":UR$=D$+"E14NL3D3":LR
$=D$+"F14NU3L3":LL$=D$+"G14NR3U3
":UL$=D$+"H14NR3D3
180 CIRCLE(125,92),5:DRAW"BM115,
97R20D80L20U80":DRAW"BM123,107NR
4BD10NR4BD10NR4BD10NR4BD10NR4BD1
0NR4BD10NR4"
190 DRAW"BM125,177D4R20G4R6H4R19
U3R3D3L3":PAINT(145,184),0,0:PAI
NT(164,180),0,0
200 CIRCLE(187,168),4:DRAW"BM186
,167R1BL2BD4E2":DRAW"BM187,172D1
2NG7F7L1H6G6"
210 DRAW"BM187,175NE8BD2E8BU1BG2
E8H2E3F4G3H2":PAINT(202,160),0,0
220 DRAW"C0BM20,130"+PP$+RR$+EE$
+SS$+SS$+NO$
230 H=48:V=36:DRAW"C0BM90,130"+N
1$:GOSUB 600
240 IF INKEY$<>"1"THEN 230
250 COLOR1,0:LINE(90,122)-(100,1
32),PSET,BF
260 X=110:Y=82:GOSUB 700:J=S
270 H=128:V=36:DRAW"C0BM90,130"+
N2$:GOSUB 600
280 IF INKEY$<>"2"THEN 270
290 COLOR1,0:LINE(90,122)-(100,1
32),PSET,BF
300 X=120:Y=82:GOSUB 700:K=S
310 H=208:V=36:DRAW"C0BM90,130"+
N3$:GOSUB 600
320 IF INKEY$<>"3"THEN 310
330 X=130:Y=82:GOSUB 700:L=S
340 IF J=1 THEN M=3 ELSE IF J=2
THEN M=5 ELSE IF J=3 THEN M=7 EL
SE IF J=4 THEN M=1 ELSE IF J=5 T
HEN M=2 ELSE IF J=6 THEN M=4 ELS
E IF J=7 THEN M=6 ELSE IF J=8 TH
EN M=8
350 IF M=1 THEN P=167 ELSE IF M=
2 THEN P=157 ELSE IF M=3 THEN P=
147 ELSE IF M=4 THEN P=137 ELSE
IF M=5 THEN P=127 ELSE IF M=6 TH
EN P=117 ELSE IF M=7 THEN P=107
ELSE IF M=8 THEN P=97
360 COLOR1,0:LINE(20,122)-(100,1
32),PSET,BF
370 FOR T=1 TO 200:NEXT:COLOR1,0
:LINE(182,152)-(206,178),PSET,BF
380 CIRCLE(187,168),4,0:DRAW"C0B
M186,167R1BL2BD4NE2F1E2":DRAW"BM
187,172D12NG7F7"
390 DRAW"BM187,177BL2NU5R4U5BL2B
U8U8L3U4R5D4L5":PAINT(187,154),0
,0
400 COLOR1,0:LINE(180,152)-(193,
178),PSET,BF
410 CIRCLE(187,168),4,0:DRAW"C0B
M186,167R1BL2BD4E2":DRAW"BM187,1
72D12NG7F7"
420 DRAW"BM187,177NH8BU2H8BD1BF1
H8G2H3E4F3G2":PAINT(171,160),0,0
430 COLOR1,0:LINE(166,152)-(193,
178),PSET,BF
440 CIRCLE(187,168),4,0:DRAW"C0B
```

```
M186,167R1BL2BD4E2":DRAW"BM187,1
72D12NG7F7"
450 DRAW"BM187,175NL10D2L10BR1BU
1L12ND2U2L5D4R5":PAINT(164,176),
0,0
460 LINE(125,177)-(125,P),PSET
470 IF M<8 THEN 480 ELSE IF M=8
THEN 500
480 IF M<3 THEN SOUND80,2 ELSE I
F M>2 AND M<6 THEN SOUND150,2 EL
SE IF M>5 AND M<8 THEN SOUND220,
2
490 GOTO570
500 PAINT(125,92),0,0:DRAW"C0BM1
17,92R8BH6F6U8D8E6G6R8"
510 DRAW"BM50,120U4H3UF3RE3DG3D4
":DRAW"BM60,120H2U4E2R3F2D4G2L3U
HU4ER3FD4GL2":DRAW"BM70,112D6F2R
2E2U6LD6GL4HU6"
520 DRAW"BM48,140RNU8R3E2U4H2L4D
R2ND6R2FD4GL4":DRAW"BM61,140U8RD
8":DRAW"BM70,140RNU8R3E2U4H2L4DR
2ND6R2FD4GL4"
530 DRAW"BM55,160U8RD8":DRAW"BM6
5,160U8NR4L3R4NR3D8"
540 PLAY"O4;V24;L8;C;C;O3;L16;A#
;A;L4;A;V24;L8;G#;A;L2;A"
550 COLOR1,0:LINE(117,84)-(133,9
6),PSET,BF:CIRCLE(125,92),5,0
560 FOR TI=1 TO 1000:NEXT:COLOR1
,0:LINE(45,110)-(78,162),PSET,BF
570 DRAW"C0BM35,130"+PP$+RR$+EE$
+SS$+SS$:DRAW"C0BM20,150"+LT$+SS
$+PP$+AA$+CC$+EE$+BB$+AA$+RR$+GT
$
580 I$=INKEY$:IF I$=CHR$(32) THE
N 590 ELSE 580
590 GOTO100
600 DRAW"C0"+RI$+"C1"+RI$
610 DRAW"C0"+LR$+"C1"+LR$
620 DRAW"C0"+DO$+"C1"+DO$
630 DRAW"C0"+LL$+"C1"+LL$
640 DRAW"C0"+LE$+"C1"+LE$
650 DRAW"C0"+UL$+"C1"+UL$
660 DRAW"C0"+UP$+"C1"+UP$
670 DRAW"C0"+UR$+"C1"+UR$
680 RETURN
700 S=RND(8):ON S GOSUB710,720,7
30,740,750,760,770,780:RETURN
710 DRAW"C0"+RI$+X$+N3$:RETURN
720 DRAW"C0"+DO$+X$+N5$:RETURN
730 DRAW"C0"+LE$+X$+N7$:RETURN
740 DRAW"C0"+UP$+X$+N1$:RETURN
750 DRAW"C0"+UR$+X$+N2$:RETURN
760 DRAW"C0"+LR$+X$+N4$:RETURN
770 DRAW"C0"+LL$+X$+N6$:RETURN
780 DRAW"C0"+UL$+X$+N8$:RETURN
800 CLS
```



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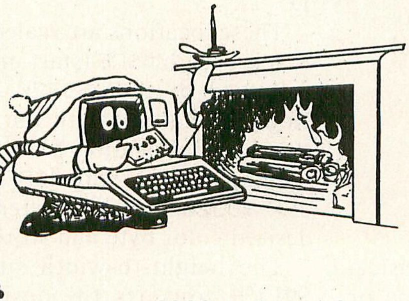

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The seventh in a series of tutorials for the beginner to intermediate machine language programmer

Machine Language Made BASIC:

Part VII: Around in Circles

By William P. Nee

The circle routine in ROM is certainly one of the most difficult to understand and use. The routine keeps alternating between its BASIC check for syntax, format, etc., and short subroutines required as set-up for the main routine. Since the BASIC checks would interfere with a machine language program, we must bypass them and implement the subroutine on our own. The following locations are used in the circle routine:

Location	
$B5	color
** $CB/CC	horizontal center of circle (X)
** $CD/CE	vertical center of circle (Y)
** $CF/D0	radius
** $D1/D2	height to width ratio
** $D3/D4	maximum horizontal coordinate
** $D5/D6	maximum vertical coordinate
$D8	circle/line flag 1: = circle, 0 = line
$D9/DA	arc end

The locations marked with two asterisks (**) must be scaled for locations, or dimensions, in any PMODE other than PMODE 4. The CIRCLE routine may be executed from three different addresses, depending on how much of the CIRCLE command you use.

The first step is to load the maximum coordinates into $D3/D4 and $D5/D6 by using the subroutine at Address $9522. This routine not only loads the correct numbers according to the PMODE, it also scales them. Next, enter the coordinates of the circle's center. This is usually done by loading Register D with the X,Y locations (i.e., #$8060 would be the center of the screen), then storing Register A in $0CC and Register B in $CE. We must show Location $CC as $0CC because *EDTASM+* requires a zero in front of any number that could also be a register, such as A, B, CC, or D.

These locations are scaled by loading Stack U with #$CB (start of X location) followed by JSR $9320. Next, load Register A (LDA) with the radius, and store it in Location $D0. Scale it by loading Stack U with #$CF followed by JSR $9320. Load Register B with the desired color byte and store it in $B5.

The height-to-width subroutine at $9EC9 converts the desired height/width ratio to a two-byte number and stores it in Location $D1/D2. The following chart identifies the number to be placed in Location $D1/D2 for each height-to-width ratio and possible PMODE screen. The numbers for PMODE 3 and 2 are twice those of PMODE 4, 1, and 0.

Height-to-Width Ratio	**PMODE 4, 1 or 0**	**PMODE 3 or 2**
.1	#$0019	#$0032
.2	#$0033	#$0066
.3	#$004C	#$0098
.4	#$0066	#$00CC
.5	#$0080	#$0100
.6	#$0099	#$0132
.7	#$00B3	#$0166
.8	#$00CC	#$0198
.9	#$00EC	#$01D8
1.0	#$0100	#$0200
1.5	#$0180	#$0300
2.0	#$0200	#$0400
2.5	#$0280	#$0500

If you want your program to run in any PMODE, include the subroutine, which checks the PMODE and doubles the height-to-width ratio when necessary:

```
        LDX     #$ **   ** use two-byte
                        number from chart
        LDA     $B6     get PMODE
        BITA    #2      register A AND 2
        BEQ     NEXT    PMODE 4, 1,
                        or 0 will equal 0
        TFR     X,D     height-to-width
                        ratio to Register D
        LEAX    D,X     double it
NEXT    STX     $D1
```

Store the number 1 in Location $D8 to indicate that no lines should be drawn. Try clearing this location in a program and see what happens.

The arc subroutine at $9FED converts an arc decimal to a two-byte number stored in Location $D9/DA.

Bill Nee bucked the "snowbird" trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo.

Many of these arcs and their two-byte equivalents are in the following chart:

Arc in Degrees
0 = #$0600
30 = #$0605
45 = #$0700
60 = #$0702
90 = #$0000
120 = #$0005
135 = #$0100
150 = #$0102
180 = #$0200

Arc in Degrees
210 = #$0205
225 = #$0300
240 = #$0302
270 = #$0400
300 = #$0405
315 = #$0500
330 = #$0502
360 = #$0600

Load Register D with the desired arc end two-byte equivalent, and store it in Location $D9/DA. Then load Register D with the arc-start two-byte equivalent and `JSR $9EFD`. Be sure to save whatever is in registers A or B prior to executing this routine if you will need them again.

Listing 1 begins by drawing a circle in the center of the screen. It continues drawing circles — each two steps larger than the previous one — until the radius reaches 90. Instead of using the standard start-up assigned by the computer, `COLOR 3,0`, this program uses `COLOR 0,3`, which sets a buff background and draws black circles.

If the height-to-width ratio is 1 and the routine draws a full circle with no arcs, you can stop after scaling the radius and `JSR $9EC2`. Again, be sure that you have already saved registers A and B. This routine also checks Location $C2 for a `PSET` or `PRESET`, stores a '1' in Location $D8 (which indicates that no lines will be drawn), and assigns the foreground color to Location $B5.

If you want to specify a height-to-width ratio other than 1, load that ratio's two-byte equivalent into Register X, the desired color into $B5, and then load `JSR $9EDF`. Using this address, the height-to-width ratio will automatically be scaled (doubled) for `PMODE 3` or 2. The routine also checks Location $C2 for a `PSET` or `PRESET` and stores a '1' in Location $D8.

Assigning arc starts and arc ends will require that you use the height-to-width ratio chart described earlier in this article. Store the correct two-byte height-to-width ratio (according to the `PMODE`) in $D1/D2; store the two-byte arc end in $D9/DA; load Register D with the two-byte arc start, then with `JSR $9EFD`.

More than one arc can be drawn by repeating the arc portion of the program as often as desired. Color changes can be made by putting the desired color into Location $B5 prior to executing the routine. Listing 2 is a program that draws different colored arcs of 60 degrees at increasing radii.

Since the first program is in `PMODE 4`, I didn't need to scale any of the numbers, but I did so to show how it is done. It is good practice to always scale since you may want to change the `PMODE` later.

The routines for drawing circles or arcs are found in Figure 1.

Before assembling either program, set Location $FF/100 to `#$2000` and execute `GC006`. If you run the assembled programs from `BASIC`, clear enough memory by entering `CLEAR 200, &H3000-1`, and change the `SWI` in Line 670 to `RTS`. ☐

```
JSR $9EC2            JSR $9EDF        JSR $9EFD
SET MAX X,Y          PLUS -           PLUS -
SET CENTER/SCALE     SET COLOR        STORE "1" IN $D8
SET RADIUS/SCALE     SET H/W RATIO    SET ARC END
                                      SET ARC START
```

Figure 1: Routines for Drawing Circles or Arcs

Listing 1: `CIRCLES`

```
                    00100 *$FF/100=#$2000
3000                00110        ORG    $3000
3000 C6    04       00120 START  LDB    #4      PMODE 4
3002 BD    9628     00130        JSR    $9628
3005 C6    01       00140        LDB    #1      PAGE 1
3007 BD    9653     00150        JSR    $9653
300A 0F    B2       00160        CLR    $B2     CLEAR FOREGROUND
300C C6    03       00170        LDB    #3
300E D7    B3       00180        STB    $B3     BACKGROUND COLOR
3010 BD    9542     00190        JSR    $9542   COLOR 0,3
3013 C6    01       00200        LDB    #1      GRAPHICS SCREEN
3015 BD    95AA     00210        JSR    $95AA
3018 C6    01       00220        LDB    #1      COLOR SET 1
301A BD    9682     00230        JSR    $9682
301D BD    9522     00240        JSR    $9522   SET MAXIMUM X,Y AND SCALE THEM
3020 CC    8060     00250        LDD    #$8060  CENTER OF THE CIRCLE(128,96)
3023 97    CC       00260        STA    $0CC    X LOCATION
3025 D7    CE       00270        STB    $CE     Y LOCATION
3027 CE    00CB     00280        LDU    #$CB    START OF X LOCATION
302A BD    9320     00290        JSR    $9320   SCALE X,Y
302D C6    02       00300        LDB    #2      SIZE OF FIRST RADIUS
302F 34    04       00310 LOOP   PSHS   B       SAVE RADIUS
```

```
3031 D7    D0      00320           STB    $D0      RADIUS LOCATION
3033 CE    00CF    00330           LDU    #$CF     START OF RADIUS LOCATION
3036 BD    9320    00340           JSR    $9320    SCALE RADIUS
3039 BD    9EC2    00350 CIRCLE    JSR    $9EC2    CIRCLE(X,Y),R
303C 35    04      00360           PULS   B        GET THE RADIUS
303E CB    02      00370           ADDB   #2       INCREASE IT
3040 C1    5A      00380           CMPB   #90      MAXIMUM RADIUS YET?
3042 23    EB      00390           BLS    LOOP
3044 BD    ADFB    00400 DONE      JSR    $ADFB    WAIT FOR INPUT
3047 5F            00410           CLRB            TEXT SCREEN
3048 BD    95AA    00420           JSR    $95AA
304B 3F            00430           SWI             RTS IF IN BASIC
           3000    00440           END    START

00000 TOTAL ERRORS
```

Listing 2: `ARCS`

```
                   00100 *  $FF/100=#$2000
3000               00110           ORG    $3000
3000 C6    03      00120 START     LDB    #3         PMODE 3
3002 BD    9628    00130           JSR    $9628
3005 C6    01      00140           LDB    #1         PAGE 1
3007 BD    9653    00150           JSR    $9653
300A BD    9542    00160           JSR    $9542      PCLS
300D C6    01      00170           LDB    #1         GRAPHICS SCREEN
300F BD    95AA    00180           JSR    $95AA
3012 C6    01      00190           LDB    #1         COLOR SET 1
3014 BD    9682    00200           JSR    $9682
3017 BD    9522    00210           JSR    $9522      SET MAXIMUM X,Y AND SCALE THEM
301A CC    8060    00220           LDD    #$8060     CENTER OF CIRCLE(128,96)
301D 97    CC      00230           STA    $0CC       X LOCATION
301F D7    CE      00240           STB    $CE        Y LOCATION
3021 CE    00CB    00250           LDU    #$CB       START OF X LOCATION
3024 BD    9320    00260           JSR    $9320      SCALE X,Y
3027 C6    02      00270           LDB    #2         SIZE OF FIRST RADIUS
3029 34    04      00280 LOOP      PSHS   B          SAVE THE RADIUS
302B D7    D0      00290           STB    $D0        RADIUS LOCATION
302D CE    00CF    00300           LDU    #$CF       START OF RADIUS LOCATION
3030 BD    9320    00310           JSR    $9320      SCALE THE RADIUS
3033 8E    0100    00320           LDX    #$0100     HEIGHT TO WIDTH RATIO = 1
3036 96    B6      00330           LDA    $B6        PMODE
3038 85    02      00340           BITA   #2         PMODE 4,1, OR 0 WILL = 0
303A 27    04      00350           BEQ    NEXT
303C 1F    10      00360           TFR    X,D        REGISTER X TO REGISTER D
303E 30    8B      00370           LEAX   D,X        ADD REGISTER D TO REGISTER X
3040 9F    D1      00380 NEXT      STX    $D1        HEIGHT TO WIDTH RATIO LOCATION
3042 CC    0155    00390           LDD    #$0155
3045 97    D8      00400           STA    $D8        NO LINES, JUST CIRCLES
3047 D7    B5      00410           STB    $B5        COLOR
3049 CC    0702    00420           LDD    #$0702     END OF ARC 1 - 60 DEGREES
304C DD    D9      00430           STD    $D9        END OF ARC LOCATION
304E CC    0600    00440           LDD    #$0600     START OF ARC 1 - 0 DEGREES
```

```
3051 BD    9EFD    00450         JSR    $9EFD    DRAW THE ARC
3054 CC    01AA    00460         LDD    #$01AA
3057 97    D8      00470         STA    $D8      NO LINES
3059 D7    B5      00480         STB    $B5      COLOR
305B CC    0200    00490         LDD    #$0200   END OF ARC 2 - 180 DEGREES
305E DD    D9      00500         STD    $D9      END OF ARC LOCATION
3060 CC    0005    00510         LDD    #$0005   START OF ARC 2 - 120 DEGREES
3063 BD    9EFD    00520         JSR    $9EFD    DRAW THE ARC
3066 CC    01FF    00530         LDD    #$01FF
3069 97    D8      00540         STA    $D8      NO LINES
306B D7    B5      00550         STB    $B5      COLOR
306D CC    0405    00560         LDD    #$0405   END OF ARC 3 - 300 DEGREES
3070 DD    D9      00570         STD    $D9      START OF ARC LOCATION
3072 CC    0302    00580         LDD    #$0302   START OF ARC 3 - 240 DEGREES
3075 BD    9EFD    00590         JSR    $9EFD    DRAW THE ARC
3078 35    04      00600         PULS   B        GET THE RADIUS
307A CB    02      00610         ADDB   #2       INCREASE IT
307C C1    5A      00620         CMPB   #90      MAXIMUM RADIUS YET?
307E 23    A9      00630         BLS    LOOP
3080 BD    ADFB    00640 DONE    JSR    $ADFB    WAIT FOR INPUT
3083 5F            00650         CLRB            TEXT SCREEN
3084 BD    95AA    00660         JSR    $95AA
3087 3F            00670         SWI             RTS IF IN BASIC
           3000    00680         END    START

00000 TOTAL ERRORS
```

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	238-0	●John Valentine, Marlborough, CT
	172-0	●Ryan Murray, Herrin, IL
	149-0	●John Breckel, Wilmington, OH
	137-0	●Scott Galvao, Tiverton, RI
	137-0	●Jennifer Johnson, Meriden, CT
	130-0	●Matthew Snider, Pinehurst, TX
	130-2	Greg Allen, Atwater, CA
COLOR CAR *(NOVASOFT)*	343,075	★Duncan Cameron, Chippewa Falls, WI
	316,550	Alan Martin, Cornwall, Ontario
	113,970	Chad Blick, Irwin, PA
	110,870	Martin Parada, Arcadia, CA
COLOR POKER (THE RAINBOW, 4/83)	60,150,600	★Earl Foster, Lynchburg, VA
THE CONTROLLERS (THE RAINBOW, 2/88)	204	★Sylvie Smith, Courtenay, British Columbia
	148	Phil Holsten, Moraga, CA
	188	Frederick Lajoie, Middleton, Nova Scotia
DALLAS QUEST *(Radio Shack)*	81	★Brad Wilson, Lithia Springs, GA
	85	Paul Summers, Orange Park, FL
	85	David and Shirley Johnson, Leicester, NC
	86	Roy Grant, Toledo, OH
	86	Melanie Moor, Florence, AL
DEF MOV (THE RAINBOW, 1/87)	50,566	★Frankie DiGiovanni, Olney, MD
	43,806	Domingo Martinez, Miami, FL
	35,331	David Schaller, Clarkston, WA
	31,673	Douglas Bacon, Middletown, CT
	30,753	Pasha Irshad, Silver Spring, MD
DEMOLITION DERBY *(Radio Shack)*	100,500	★Richard Winkelbauer, Bronx, NY
DEMON ATTACK *(Imagic)*	279,435	★Jon Hobson, Plainfield, WI
	202,260	Tom Briggs, Hillsdale, NY
	89,285	Upton Thomas, Arnold, MD
	72,410	Glenn Hodgson, Aberdeenshire, Scotland
	67,760	Jim Davis, Sandwich, IL
DESERT PATROL *(Arcade Animation)*	234,300	★Steven Turcotte, Matane, Quebec
DESERT RIDER *(Radio Shack)*	80,703	★Thomas Payton, Anderson, SC
	65,351	Jason Hackley, Clinton, CT
	64,789	Roby Janssen, Clear Lake, IA
	63,014	Rebecca Henderson, Ballston Spa, NY
	62,702	William Currie, Bryans Road, MD
DEVIL ASSAULT *(Tom Mix)*	1,866,100	★Stephane Martel, Laval, Quebec
	623,550	Dale Krueger, Maple Ridge, British Columbia
	75,000	Blake Cadmus, Reading, PA
	40,800	Benoit Landry, Drummondville, Quebec
DONPAN *(Radio Shack)*	53,100	★Jim Davis, Sandwich, IL
	52,600	Eric Olson, Wheaton, IL
DOWNLAND *(Radio Shack)*	125,450	★Pat Norris, O'Fallon, MO
	99,982	Eric Mellon, Newark, DE
	99,980	Danny Wimett, Rome, NY
	98,985	Karl Gulliford, Summerville, SC
	97,740	Stephane Deshaies, Beloeil, Quebec
DRACONIAN *(Tom Mix)*	114,470	★Donna Ashby, Annandale, VA
DRAGON FIRE *(Radio Shack)*	160,835	★Eric Olson, Wheaton, IL
	146,325	Stephane Martel, Laval, Quebec
	14,856	Jesse Cogdell, Wilmington, DE
	11,726	Marcos Rodriguez, New York, NY
	9,861	Michael Adams, Columbia, SC
ENCHANTER *(Infocom)*	400/223	★Konnie Grant, Toledo, OH
ESCAPE 2012 *(Computerware)*	202	★Roy Grant, Toledo, OH
	199	Milan Parekh, Anaheim, CA
FIRESTORM (THE RAINBOW, 1/86)	22,505	★Chad Presley, Luseland, Saskatchewan
	11,250	Stephane Martel, Laval, Quebec
	5,680	Kathy Rumpel, Arcadia, WI
FIRESTORM (continued)	3,760	Rick Beevers, Bloomfield, MN
	3,505	Blake Cadmus, Reading, PA
GALACTIC ATTACK *(Radio Shack)*	31,100	★Upton Thomas, Arnold, MD
	29,030	David Czarnecki, Northhampton, MA
	26,370	Jeff Remick, Warren, MI
	22,250	Dave Staub, Moundsville, WV
	11,830	Sheldon Penney, Green Bay, Newfoundland
GALAGON *(Spectral Associates)*	751,020	★Sofia Giorgi, Brasilia, Brazil
	357,890	Jason Clough, Houston, TX
	328,820	Bernard Burke, Lee's Summit, MO
	249,960	Matthew Fumich, Munford, TN
	169,410	Danny Dunne, Pittsfield, NH
GANTELET *(Diecom Products)*	45,235,820	★Ken Hubbard, Madison, WI
	23,643,720	Geran Stalker, Rivordalo, GA
	20,921,490	Randall Edwards, Dunlap, KS
	10,222,940	Clinton Morell, Sacramento, CA
	7,493,340	Stirling Dell, Dundalk, Ontario
GANTELET II *(Diecom Products)*	17,701,060	★Bryan Bell, Manassas, VA
GATES (THE RAINBOW, 8/86)	600	★Brian Matherne, Gretna, LA
GHANA BWANA *(Radio Shack)*	2,350,750	★Michael Heitz, Chicago, IL
	702,520	Joseph Delaney, Augusta, GA
	282,070	Kelly Jones, West Salem, OH
	174,410	Caraann Jentzsch, Dufur, OR
	105,820	David Reash, Hadley, PA
GIN CHAMPION *(Radio Shack)*	1,602-0	★●Jimmy Garner, Ft. Worth, TX
	1,120-0	●Kim Johns, Port Cog., British Columbia
GOLD RUNNER *(NOVASOFT)*	2,031,800	★Gary Grant, Exeter, Ontario
GRANDPRIX CHALLENGE *(Diecom Products)*	67,710	★H. Dingwell, Litchfield, CT
GROBOT *(Children's Computer Workshop)*	9,665	★Wendy Staub, Moundsville, WV
	8,090	Curt Lebel, Louisville, KY
HELICOPTER HERO (THE RAINBOW, 3/88)	103	★Phil Holsten, Moraga, CA
HITCHHIKER'S GUIDE TO THE GALAXY *(Infocom)*	400/359	★Roy Grant, Toledo, OH
	400/422	Jeff Holtham, Waterloo, Ontario
	400/510	Brad Wilson, Lithia Springs, GA
INTERBANK INCIDENT *(Radio Shack)*	4,861	★Shara and Chris Euton, Lilburn, GA
IRON FOREST *(Diecom Products)*	3,631,600	★Douglas Paulson, Richfield, ID
	3,173,200	Charles Boyd, Amarillo, TX
	2,676,300	Janet Boyd, Amarillo, TX
	1,335,500	Jack Faircloth, Nashville, TN
	1,141,650	Craig Pennell, Amarillo, TX
	790,850	Scott Godfrey, Nashua, NH
JOKER POKER (THE RAINBOW, 3/87)	62,067,906	★Carole Rueckert, Mansfield, OH
	21,733,284	Jon Fogarty, Yale, MI
	8,179,710	Brenda Kim, Athens, OH
	3,796,898	Curtis Trammel, Murphysboro, IL
	2,793,285	Blain Jamieson, Kingston, Ontario
JUNIOR'S REVENGE *(Computerware)*	2,503,000	★Stephane Martel, Laval, Quebec
	257,600	Keith Cohen, Rocky Mount, NC
JUNKFOOD (THE RAINBOW, 11/84)	535,760	★Charlie Ginn, Augusta, GA
	18,990	Joel Klein, Indianapolis, IN
KING PEDE *(T & D Software)*	83,855	★Mike Snyder, Allen, OK

SCOREBOARD

KNOCK OUT *(Diecom Products)*	
472,995	★Frank D'Amato, Brooklyn, NY
183,675	Rush Caley, Port Orchard, WA
162,555	Martin Parada, Arcadia, CA
147,235	Mike LeBrun, Cornwall, Ontario
KORONIS RIFT *(Epyx)*	
186,710	★Tony Harbin, Cullman, AL
184,180	Russell Johnson, Sarnia, Ontario
184,120	John Farrar, Lebanon, TN
174,810	Donald Cathcart, Halifax, Nova Scotia
133,990	Paul Blessing, Spring, TX
KUNG-FU DUDE *(Sundog Systems)*	
32,000	★Tony Geitgey, University Park, PA
14,305	David Schulze, San Antonio, TX
12,150	Cody Deegan, Fallon, NV
THE LAIR *(Freebooter Software)*	
112,940	★James Walton, Pittsburgh, PA
LANDER *(T&D Software)*	
780	★Ari Enkin, Neapen, Ontario
LASER SURGEON: THE MICROSCOPIC MISSION *(Activision)*	
42,767	★Joe Stanley, Harrisburg, IL
LUNAR-ROVER PATROL *(Spectral Associates)*	
45,700	★Kameron Pence, Little Rock, AR
37,890	Dave Staub, Moundsville, WV
30,000	Vincent Tremblay, Matane, Quebec
MARBLE MAZE *(Diecom Products)*	
353,220	★David Boland, Dubuque, IA
17,530	Dave Staub, Moundsville, WV
A MAZING WORLD OF MALCOLM MORTAR *(Radio Shack)*	
6,125	★Stephen McJohnathan, Keymar, MD
5,030	Jeanne Henning, Quincy, IL
MEMOCARDS (THE RAINBOW, 8/87)	
3,120	★Lise Gagne, St-David, Quebec
1,596	Brian Willwerth, Hingham, MA
1,470	Jan Walotklewicz, Two Rivers, WI
1,418	Edward Kavanaugh, North Easton, MA
1,414	Sara Mittelstaedt, Kiel, WI
MINIGOLF (THE RAINBOW, 5/86)	
29	★John Guptill, Columbia, MO
43	Brian Matherne, Greta, LA
MISSION: F-16 ASSAULT *(Diecom Products)*	
468,750	★Karen Jessen, Cleveland, OH
355,570	Stirling Dell, Dundalk, Ontario
318,160	Jeremy Pruski, Sandwich, IL
144,510	Donald Cathcart, Halifax, Nova Scotia
137,920	Mike Grant, Fresno, CA
MISSION: RUSH'N ASSAULT *(Diecom Products)*	
361,750	★Clay Jones, Wooster, OH
195,250	Kelly Jones, West Salem, OH
MONSTER MAZE *(Radio Shack)*	
12,950	★Paul DeVita, Vallejo, CA
MOON SHUTTLE *(Datasoft)*	
16,220	★Christopher Cromwell, Monument, CO
ONE-ON-ONE *(Radio Shack)*	
1,310-0	★●Jon Breckel, Wilmington, OH
1,302-0	●Thomas Payton, Anderson, SC
1,276-0	●Jonathan Dorris, Indianapolis, IN
1,260-0	●Brandon Reece, Chickamauga, GA
1,242-0	●William Currie, Bryans Road, MD
OUTHOUSE *(MichTron)*	
59,641	★Sam Zehel, Coal Center, PA
38,640	Dave Staub, Moundsville, WV
PAC PANIC *(Cougar)*	
34,950	★Heather Hamblen, Bar Harbor, ME
PITFALL II *(Activision)*	
197,048	★Keith Catrett, Montgomery, AL
164,088	John Akan, Chippewa Falls, WI
159,400	David Cornette, Green Bay, WI
104,479	David Stewart, Kent, OH
POLTERGEIST *(Radio Shack)*	
3,300	★Jon Breckel, Wilmington, OH
POOYAN *(Datasoft)*	
566,850	★Lois Crowson, East Alton, IL
373,900	Duncan Cameron, Chippewa Falls, WI
236,650	Jeff Mrochuk, Edmonton, Alberta
111,600	William Cathey, Kings Mtn., NC
PROSPECTOR *(THE RAINBOW, 12/88)*	
15,150	★Cray Augsburg
4,050	Jutta Kapfhammer
3,550	Lauren Willoughby
PYRAMID *(Radio Shack)*	
220	★Jason Ebbeling, Berkshire, MA
PYRAMID 2000 *(Radio Shack)*	
220	★Darren King, Yorkton, Saskatchewan
220	★Mike Snyder, Allen, OK
125	Chris VanOosbree, Emmetsburg, IA
PYRAMID (continued)	
100	Peter Antonacopoulos, Toa Baja, Puerto Rico
PYRAMIX *(Color Venture)*	
68,550	★Andy Freeman, Turtle Lake, WI
67,850	Richard Winkelbauer, Bronx, NY
56,970	Andy Freeman, Turtle Lake, WI
37,500	Matthew Smith, Courtenay, British Columbia
26,900	Todd Kopke, Glendale Heights, IL
QUIX *(Tom Mix)*	
8,407,772	★John Haldane, Tempe, AZ
1,404,000	Curtis Goodson, Sao Paulo, Brazil
1,201,383	Milan Parekh, Anaheim, CA
1,003,104	Elisa Goodson, Sao Paulo, Brazil
326,192	Martin Parada, Arcadia, CA
RADIO BALL *(Radio Shack)*	
1,780,870	★Jocelyn Gagne, St-David, Quebec
1,761,030	Eric Mellon, Newark, DE
1,666,670	Lise Gagne, St-David, Qeubec
1,116,050	Richard Winkelbauer, Bronx, NY
1,062,190	Eric Mellon, Newark, DE
996,750	Steve Slaven, Yakima, WA
800,150	Mike Snyder, Allen, OK
760,380	Jake Runge, Franklin, OH
612,800	Jesse Cogdell, Wilmington, DE
RED ALERT *(Ark Royal)*	
Ensign-Class 4	★Richard Kelton, Newport News, VA
RESCUE ON FRACTALUS *(Epyx)*	
1,000,948	★Steven Ujvary, Calgary, Alberta
323,167	Kenneth Hill, Severna Park, MD
292,633	David Richards, Huntington, WV
288,084	Donald Cathcart, Halifax, Nova Scotia
270,000	Russell Johnson, Sarnia, Ontario
RETURN OF JUNIOR'S REVENGE *(Colorware)*	
1,792,800	★Chad Presley, Luseland, Saskatchewan
ROGUE *(Epyx)*	
71,833	★Jon Fogarty, Yale, MI
65,529	Joseph H. Campbell, Norfolk, VA
63,934	Marshall Weisenburger, Quincy, IL
43,222	Hans Lutenegger, Madison, IA
27,542	Melanie Lapoint, Fitchburg, MA
RUSH'N ASSAULT *(Diecom)*	
28,600	★David Morrison, Jr., Brewer, ME
SAILOR MAN *(Tom Mix)*	
427,700	★Marnie Schalm, Edson, Alberta,
231,900	Jessica Wilkins, Seymour, TN
231,700	Luis Camino, Lima, Peru
SANDS OF EGYPT *(Radio Shack)*	
67	★Tristan Terkuc, Richmond, Ontario
82	Edward Rocha, Cobleskill, NY
85	Paul Summers, Orange Park, FL
86	Roy Grant, Toledo, OH
87	Neil Haupt, Elyria, OH
SAUCER DEFENSE *(THE RAINBOW, 4/87)*	
40,000	★David Hartmann, Osoyoos, British Columbia
4,000	Frankie DiGiovanni, Olney, MD
SHAMUS *(Radio Shack)*	
30,515	★Scott Galvao, Tiverton, RI
29,850	Doug Burns, Moscow, OH
28,150	Greg Allen, Atwater, CA
25,450	John Garness, Newell, SD
SHOOTING GALLERY *(Radio Shack)*	
27,270	★Jocelyn Hellyer, Montgomery, IL
25,510	Donald Knudson, Minot, ND
20,480	Kevin Pereira, Corsicana, TX
SHOOT'N RANGE (THE RAINBOW, 8/87)	
55,623	★Paul Robbins, Picayune, MS
14,702	Richard Winkelbauer, Bronx, NY
13,794	Phillip Holsten, Modesto, CA
6,082	David Morrison, Brewer, ME
5,433	Benoit Landry, Drummondville, Quebec
SLAY THE NERIUS *(Radio Shack)*	
73,091	★Jeff Remick, Warren, MI
SNEAKY SNAKE (THE RAINBOW, 8/87)	
63	★Matthew Smith, Courtenay, British Columbia
SPACE INVADERS *(Spectral Associates)*	
3,920	★Ari Enkin, Neapen, Ontario
SPACE ASSAULT *(Radio Shack)*	
13,110	★Jeff Remick, Warren, MI
7,280	Jason Kopp, Downs, IL
6,200	John Weaver, Amsterdam, NY
SPEED RACER *(MichTron)*	
95,640	★David Morrison, Brewer, ME
SPEED RACER (continued)	
94,430	Christopher Cromwell, Monument, CO
SPEEDSTER (THE RAINBOW 8/87)	
211,300	★Paul Robbins, Picayune, MS
117,080	Bill Millington, Meriden, CT
103,140	Richard Winkelbauer, Bronx, NY
88,090	Jason Landreth, Texico, IL
60,430	Jennifer Johnson, Meriden, CT
44,540	Kevin Pereira, Corsicana, TX
15,770	Jesse Cogdell, Wilmington, DE
SPIDERCIDE *(Radio Shack)*	
27,730	★Mike LeBrun, Cornwall, Ontario
3,460	David Morrison, Brewer, ME
2,500	Wendy Staub, Moundsville, WV
1,840	Dave Staub, Moundsville, WV
1,650	Philip Salathe, South Sutton, NH
SPRINGSTER *(Radio Shack)*	
303,520	★Mavis Hartmann, Osoyoos, British Columbia
200,670	Denise Root, Thorndale, PA
STAR BLAZE *(Radio Shack)*	
6,550	★Flint Weller, Swarthmore, PA
STRATA (THE RAINBOW, 5/88)	
2,888	★Paul Robbins, Picayune, MS
2,768	H. Dingwell, Litchfield, CT
TEMPLE OF ROM *(Radio Shack)*	
604,000	★Troy Graham, Arnold, MD
507,700	Adam Broughton, Morris, PA
303,600	Tim Hennon, Highland, IN
138,400	Gary Budzak, Westerville, OH
125,200	Michelle Murray, Salem, IN
119,201	Jeffrey Ryan Horstman, Ospray, FL
THEXDER *(Sierra On-Line)*	
2,033,000	★Frankie DiGiovanni, Olney, MD
1,823,900	Tom Gauwitz, Roanoke, IL
1,411,700	Steve Hallin, Biloxi, MS
531,400	David Morrison, Jr., Brewer, ME
312,300	Timothy DeJong, Rock Valley, IA
TIME BANDIT *(MichTron)*	
76,030	★Brent Morgan, Centerville, OH
59,020	Stephanie Morgan, Centerville, OH
TREKBOER *(Mark Data)*	
123	★Roy Grant, Toledo, OH
132	Matthew Fumich, Munford, TN
TRIG ATTACK *(Sugar Software)*	
196,000	★Cassaundra Stewart, Sacramento, CA
TUT'S TOMB (THE RAINBOW, 7/88)	
53,280	★William Currie, Bryans Road, MD
VARLOC *(Radio Shack)*	
2,502	★Frank D'Amato, Brooklyn, NY
2,032	Tony Harbin, Cullman, AL
2,032	Edward Rocha, Cobleskill, NY
2,013	Ryan Grady, Newbury Park, CA
2,011	Antonio Souza III, North Dartmouth, MA
VICIOUS VIC (THE RAINBOW, 7/86)	
18,813	★Talib Khan, Bronx, NY
15,063	John Conley, Everett, WA
14,613	Carolyn de Lambert, Everett, WA
11,902	Martha James, Swarthmore, PA
10,489	Karl Gulliford, Summerville, SC
WILDWEST *(Tom Mix)*	
35	★Paul Summers, Orange Park, FL
WISHBRINGER *(Infocom)*	
400/201	★Brad Wilson, Lithia Springs, GA
WIZARD'S DEN *(Tom Mix)*	
593,950	★Richard Winkelbauer, Bronx, NY
425,350	Leif Smedberg, Columbia City, IN
195,050	Mark Touchette, Preston, CT
WRESTLE MANIAC *(Diecom)*	
956,971	★Marc Reiter, Cincinnati, OH
546,315	Louis Bouchard, Gatineau, Quebec
45,483	Tony Bacon, Mt. Vernon, IN
42,105	David Brown, New Waterford, Nova Scotia
41,125	Doug Burns, Moscow, OH
ZONERUNNER *(Radio Shack)*	
5,918	★Sam Zehel, Coal Center, PA
ZONX (THE RAINBOW, 10/85)	
12,000	★Adam Broughton, Morris, PA
ZORK I(Infocom)	
350/328	★Konnie Grant, Toledo, OH
350/587	Matthew Yarrows, Easthampton, MA

— Sue Evans

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints, tips or responses to questions, or want help yourself, we encourage you to write to the Scoreboard, c/o THE RAINBOW.

In response to questions from:

- Ted Klug: In *Sands of Egypt*, go east three times from the dead snake to get the canteen. Go down from the top of the cliff, south and dig for the magnifier. Use the objects in the upper right corner to "climb" out of the pool.
- Joan Laansoo: In *Sands of Egypt*, go south twice from the top of the cliff and dig to find the torch.

Phil Holsten
Moraga, CA

- Jamin Dorward: In *Vortex Factor*, to start the time machine get the lime from the back room and cut it with the saw. Squeeze lime into the vile, pour the vile into the battery, place the cartridge and press the button.

How do you light up the caverns in the Cairo Moon (while travelling with the cartridge)?

In *Major Istar* how do you move the boulder from the undersea caverns. How do you make the vaccine and how many ingredients do you need?

Eurik Perez
New York, NY

- John Riddle: In *Robot Odyssey*, to rewire the robots use the subway token detector.

I'm on the last level at the sonic rock, but how can I get past it?

Kelly Jones
West Salem, OH

- Jim Forster: In the *Interbank Incident*, the back rooms of the Louvre and the Seattle museum can be opened using the smaller key to reveal security stations.

What do you do after finding the code book? What are the transmitter and rod used for? How do you get through the wall panel on the boat? (There is a slot for something there, but I don't know what.) And how do you get on the army base?

Eric Stork
Staten Island, NY

Bedlam

Scoreboard:

In *Bedlam*, how do you get past the dog and how do you get the green key from the shock room? After opening the secret door, how do you go through it?

To get the red key out of the cabinet, use the hook from the maintenance room.

Alan Lindabery
Thorndale, PA

Dungeons of Daggorath

In *Dungeons of Daggorath*, the response time on Level 2 is very slow and I get killed before my commands are even executed. Is there anything I can do to stop this? How do I kill the knights and the stone giants without the ring? I have attacked over 20 times with the iron sword with no success.

Alan Lindabery
Thorndale, PA

Scoreboard:

In *Dungeons of Daggorath*, I came across a knight with a shield on Level 3. What does the knight carry and what is the best way to kill him?

Kevin Pereira
Corsicana, TX

Scoreboard:

In *Dungeons of Daggorath*, to kill the wizard on the sixth level, you have to get the mirthil shield and elvish sword. Then get the wizard in a hallaway and hit him with the shield four times. Type `M` and run away. Keep hitting and running for about 20 minutes. Then get away from him and rest. When he comes back attack him with the joule ring (incant energy). Move away and rest, then attack with your ring again. If he does not die, run away and rest until he comes back and fire again with the energy ring.

To incant the supreme ring, type `INCANT FINAL`

Robbie Davis
Nackawic, N.B.

Gates of Delirium

Scoreboard:

In *Gates of Delirium*, how do you get your man's strength, dexterity, intelligence and wisdom up? Where are the people that will join you?

Jonathan Wanagel
Freeville, NY

Interbank Incident

Scoreboard:

Here are some hints for the *Interbank Incident*. The bartender on the train in Paris has the key to the train's baggage room door and to the Louvre security room door. In examining the far right side of the living quarters' roof, I saw a roof entryway. When in the baggage car, examine the mailbag.

Does anyone know how to reach the roof entryway in the living quarters in Seattle? How do you enter the storage rooms in the Eiffel Tower or the Space Needle? How do you enter the submarine and the jet fighter in Munich?

Frankie DiGiovanni
Olney, MD

Kung-Fu Dude

Scorecard:

In *Kung-Fu Dude*, when you get to the Dark Temple and reach the first gunman, don't attack him after he fires all four bullets. He'll just keep firing if you do.

The barrels are tough. I don't know if there's any special technique of getting over all the barrels unscathed, but if anybody knows, please let me know.

Cody Deegan
Fallon, NV

Lansford Mansion

Scoreboard:

In *Lansford Mansion*, how do you get rid of the guard for good? Where are the treasures?

Jason Andrew
Madison, WI

To respond to other readers' inquiries and requests for assistance, reply to "Scoreboard Pointers," c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will share your reply with all "Scoreboard" readers in an upcoming issue.

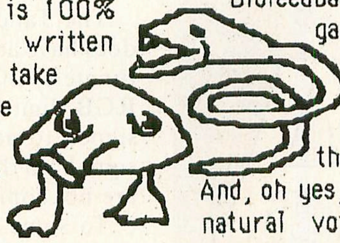
For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`. Be sure to include your complete name and address.

Dr. Preble's Programs

For Color Computer Software
Since 1983

Pyramix

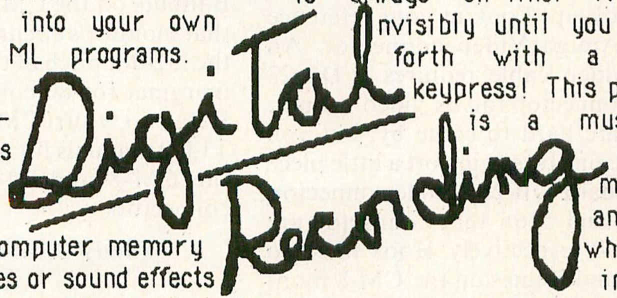
This fascinating CoCo 3 game continues to be one of our best sellers. **Pyramix** is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordon Tsvetkoff and a product of **ColorVenture**.



The Freedom Series

Vocal Freedom

I've got to admit, this is one nifty computer program. **Vocal Freedom** turns your computer into a digital voice recorder. The optional **Hacker's Pac** lets you incorporate voices or sounds that you record into your own BASIC or ML programs. This is not a synthesizer. Sounds are digitized directly into computer memory so that voices or sound effects sound very natural. One "off-the-shelf" application for Vocal Freedom is an automatic message minder. Record a message for your family into memory. Set Vocal Freedom on automatic. When Vocal Freedom "hears" any noise in the room, it plays the pre-recorded message! Disk operations are supported. VF also tests memory to take advantage of from 64K up to a full 512K. Requires low cost amplifier (RS cat. #277-1008) and any microphone.



Mental Freedom

Would your friends be impressed if your computer could read their minds? **Mental Freedom** uses the techniques of Biofeedback to control video game action on the screen. Telekinesis? Yes, you control the action with your thoughts and emotions. And, oh yes, it talks in a perfectly natural voice without using a speech synthesizer! Requires Radio Shack's low cost Biofeedback monitor, Cat. #63-675.

BASIC Freedom

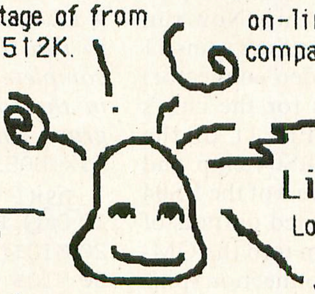
Do you ever type in BASIC programs, manually? If you do, you know it can be a real chore. **Basic Freedom** changes all that. It gives you a full screen editor just like a word processor, but for BASIC programs. Once loaded in, it is always on-line. It hides nvisibly until you call it forth with a single keypress! This program is a must for programers or anyone who types in programs. By Chris Babcock and a product of **ColorVenture**.

Lightning Series

These three utilities give real power to your CoCo 3.

Ramdisk Lightning

This is the best Ramdisk available. It lets you have up to 4 mechanical disk drives and 2 Ram drives on-line and is fully compatible with our printer spooler below



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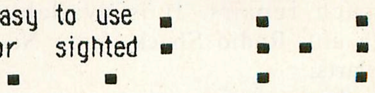

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COCO Q&A CONSULTATIONS

By Marty Goodman
Rainbow Contributing Editor

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW'S *CoCo SIG and database manager of OS-9 Online.*

Joystick Repairs

My joystick plug fell apart. I need to know what wire goes to what so I can solder on a new plug.

Brian Malfant
Largo, FL

If you plan to do your own CoCo hardware repairs, it is essential that you own a copy of the Tandy Service Manual for your computer. It will give you all the information necessary to complete such repairs. It is available through any Radio Shack, from National Parts.

To replace your joystick, look at the solder lugs on the plug for your CoCo 3 joystick. (See Figure 1.) The pin assignments are as follows:

Pin 1	X axis potentiometer wiper
Pin 2	Y axis potentiometer wiper
Pin 3	ground
Pin 4	fire button number 1
Pin 5	+ 5 volts
Pin 6	fire button number 2

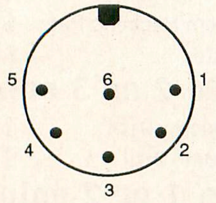

Figure 1: CoCo 3 Joystick Plug

(Note that one side of each of the joystick's two potentiometers is connected to ground and the other side of each is hooked to +5 volts.)

Connector Alterations

How can I hook a CM-8 RGB monitor to an Amiga 500?

Danny Hale
(DANNYHALE)
Joplin, MO

To do this, convert the down-going (negative) sync pulses from the Amiga into the up-going (positive) sync pulses needed by the CM-8. The rest is just cable hook-up. Look at your reference on the Amiga Video connector. An Amiga video cable requires a DB-23 female connector for its video output. DB-23s are hard to come by, but you can make one by sawing off a little piece of a standard DB-25 female connector. Pins 3,4 and 5 on that connector are R,G and B respectively. Hook those to the R,G and B lines on the CM-8 monitor (pins 3,4 and 5 of the CM-8's 10-pin connector). Pins 13, 16, 17, 18, 19 and 20 of the Amiga connector are *ground.* Connect them to pins 1 and 2 of the CM-8's connector.

You need a 74LS04 chip. Hook its +5-volt pin (Pin 14 on the chip, also called Vcc) to the +5-volt line on the Amiga (Pin 23). Hook up that chip's ground pin (Pin 7) to the Amiga's ground pins. Solder a .1-mfd capacitor between pins 7 and 14 of the 74LS04 chip. Now run the Amiga's H and V sync lines (pins 11 and 12 on the Amiga video connector) into each of two inputs for the chip's inverter gates. Hook Pin 11 of the Amiga to Pin 1 of the LS04 chip and Pin 12 of the Amiga to Pin 3 of the LS04 chip. Then take the inverted outputs of those gates and feed them into the CM-8's H and V sync input connection (pins 8 and 9, respectively, on the CM-8 connector).

Modifying Inputs

Can I use my CM-8 monitor with a Tandy 1400 portable computer? Tandy says it cannot be done.

George E. Leonhard
Woodstock, GA

The Tandy 1400 portable computer does have an RGB video output. Unfortunately, that output only provides an RGB digital signal. The CM-8 is designed to accept only an RGB analog signal. So the CM-8 and the 1400 really are not compatible.

To some extent, you can fake it by making a cable that feeds the R,G and B signals from the T1400 into the R,G and B inputs on the CM-8. Next, hook up H and V sync and ground, and ignore the 'I' line from the T1400. This should result in a reasonable image on the CM-8. Please note that you will get only eight colors (including black and white), rather than the 16 normally available with IBM-type RGB I CGA signals.

Although you may get readable text, you will be over-driving the R, G and B inputs on the CM-8 and *could* injure that monitor's circuitry. Remember that the .51-dot pitch of the CM-8 is, at best, marginal for 80-column text displays. Refer to your CM-8, CoCo 3, and T1400 manuals for the exact pin outs of the CM-8 and T1400 RGB I video connectors.

Tandy OS-9 Games Patch

Marty, using the tip you gave me on Delphi, I wrote a simple patch program that will allow Trivia Fever *and all other Tandy game programs that boot up under OS-9 Level 1 Version 1.1 to be played on the CoCo 3. As you pointed out, the fix does cause a crash or cold start if you press the reset button instead of rebooting. However, this is not a problem in actually running the game. Owners of* Trivia Fever *and other OS-9 Level 1 Version 1.1 games who wish to run them on their CoCo 3 should complete the following steps. First, type in the following five-line* BASIC *program, and save it to disk as* `TRIV-FIX.BAS`*:*

```
   DSKI
10 DKSI$0,34,1,UH$,LH$
20 MID$(UH$,74,1)=CHR$(239)
30 MID$(UH$,85,1)=CHR$(239)
40 DSKO$0,34,1,UH$,LH$
50 END
```

Put that disk aside. Now, make a backup of the game disk that you want to fix. For games that have more than one disk, use the disk that you use to boot the game (the one that you normally insert in Drive 0 before typing `DOS` *in order to start the game). Next, load* Trivia Fix *into memory, and put the backup of your game boot disk in Drive 0. Run. The drive will spin for a bit, and its light will come on. When you get the OK prompt again, your disk will be ready for operation on a CoCo 3. Note that this fix can be completed on a CoCo 3, so an earlier model CoCo is not needed to fix these games to run on the CoCo 3.*

Lee Maice, Jr.
(MAICE)
Washington, DC

Nice work, Lee! The problem with *Trivia Fever* and all OS-9 Level 1 Version 1.0 and 1.1 games is that the boot program block moves itself over the 256 bytes at $FE00 through $FEFF, smashing the interrupt vectors on the CoCo 3. Your fix changes the boot program location, so it will not trample the CoCo 3 interrupts. The fix will work on all games using OS-9 Level 1 Version 1.1. (This includes most of Tandy's older OS-9 programs that are incompatible with the CoCo 3.) Most programs written using an OS-9 Level 1 Version 1.0 boot will work with this fix.

Assembly language tinkerers can fix the Level 1 Version 1.0 boot program by transferring the contents of Track 34 of the game disk (the boot file) to CoCo memory starting at $2600. Disassemble the code there, look for a block move in the first 256 bytes and a subsequent jump to the code that was moved. The target address for the block move, and for the subsequent jump, need to be lowered by Hex 100 — probably by changing the target address and the corresponding jump from $F000 to $EF00.

No Dual Printing

Can I run two printers (such as a DWP 230 and a DMP 130A) simultaneously, feeding them data from a single computer?

Charles N. Shew
SHEW

For most practical purposes, you *cannot* run two printers simultaneously. The computer sends data to the printer, but the printer also tells the computer (via a *handshake* line) when to stop sending data because its buffer is full. If you hook up *two* printers on the same serial line, the *buffer full* handshake will not work properly for either. Also, the DMP 130A and the DWP 230 use different control codes. Therefore, you couldn't use even the more common special features, like underline and boldface.

Although you could use TTL and Level converter chips to do a logical `OR` to the two busy signals and halt the computer when either printer's buffer is full, this decreases efficiency. It would be better to use a printer switch and print first from one and then from the other printer. Most users who have both types of printers use their serial printer to print out draft copies, use those copies for editing and then use the daisy wheel printer for the final copy. In such use, it makes little sense to have both printers printing out the same file at the same time.

Baud-Rate Changes

I'd like to pass along the following to CoCo 3 users: If you are running your CoCo 3 at double speed (`POKE &HFFD9,0`*), and want to send data to the printer using the internal serial port, change the baud-rate constant of* BASIC *to the one used at slow CPU speed for the next lowest baud rate. The following table shows the constants to poke into Address 150 to adjust the baud rate of a CoCo 3 running at double speed:*

Baud	***Constant***
600	*180*
1200	*87*
2400	*41*
4800	*18*
9600	*6*

To run the internal serial port at 300 baud when the CoCo is operating at double speed, you will have to poke a `1` *into Address 149 and then experiment with the correct value for Address 150. This value will be a number a little less than 200. All addresses and constants given concerning these baud-rate changes are in decimal notation.*

Art Flexser
(ARTFLEXSER)
Author of ADOS-3
Miami, FL

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

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Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type `ASK` (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form which has complete instructions.

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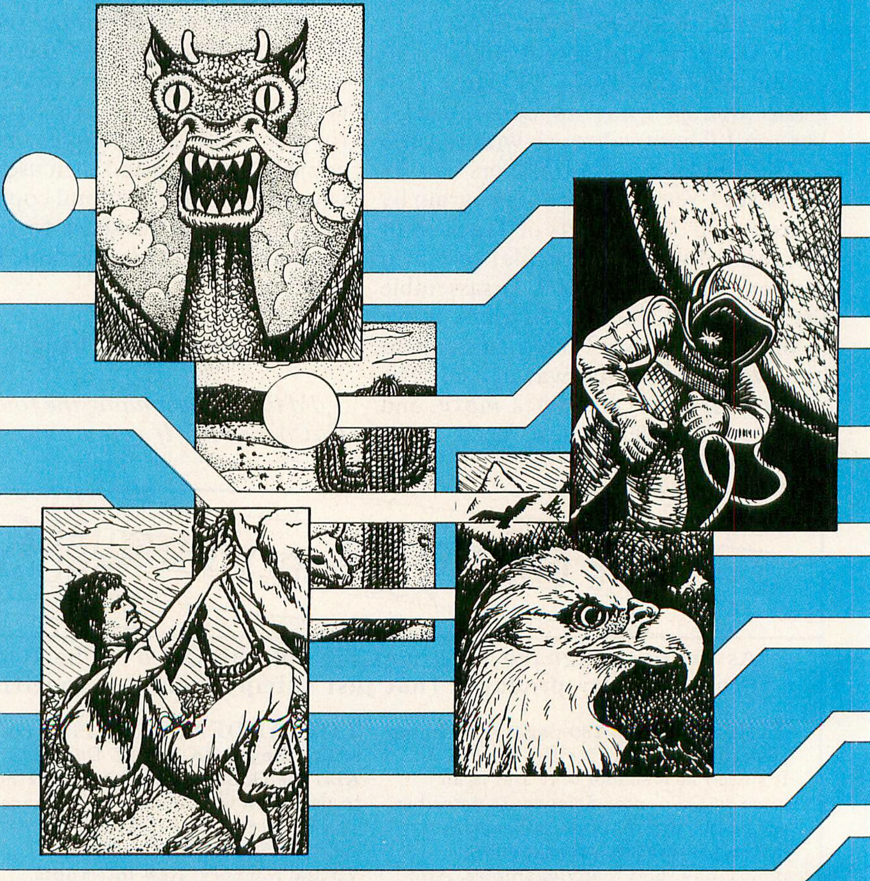

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PLEASE CIRCLE
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Secret Codes

When privacy is vital, use this cryptological key to send the message without fear of discovery

By Clem Bedard

A cipher is defined in the dictionary as a secret method of writing, which transposes or substitutes letters of the alphabet. To *encrypt* (encode) a message, you must use one of the many transformation systems on the message. To *decipher* (decode) it, the reverse procedure is applied. One such system of transformation uses a random non-repeating additive key and is known as the *one-time pad* system. The program *Cipher* simulates this system while reducing a problem known as the *key distribution problem.*

An Additive Key System

The one-time pad system is considered unbreakable in both theory and practice. Although it is beyond the scope of this article to fully analyze this system, we will encrypt a short message to show the different steps involved in transforming ordinary text into ciphered text when using an additive key system. To demonstrate how the program *Cipher* works, let's manually encode the following phrase:

Keep all messages secret.

First, it is necessary to convert the plain text into *numerical* text. There are many ways in which this can be done, but for this example, we will substitute the ASCII code for each letter of the plain text to give us the following numerical text:

75-69-69-80-65-76-76-77-69-83-83-65-71-69-83-83-69-67-82-69-84

At this point, the message is not encrypted; it is written simply as a computer might represent it. It would be easy for a cryptanalyst (spy) to reconstruct the original message from the numerical text.

To make life more difficult for the cryptanalyst, let's generate a series of random numbers. This string of numbers is called the *key* and should be *at least* equal in length to the numerical text in order to avoid repetition of the random sequence. The following string meets our requirements:

8-5-12-10-14-9-6-13-2-15-10-4-8-15-12-6-9-2-11-7-1

Now we proceed to the final step of our encryption and add the random key to the numerical text to produce the *Cipher* text. Our example text would then look like Figure 1.

In comparing the numerical text to the plain text, we see that every time a letter is repeated in the plain text, the corresponding number in the numerical text is also repeated. This is a simple substitution and offers little security to the exchange of confidential information. In contrast, the cryptanalyst trying to analyze the *Cipher* text has no way of knowing how a number was derived. Is 83 the sum of 41 plus 42, or is it the result of adding 1 to 82? Each number of the cipher text becomes an equation with two un-

---

Clem Bedard is an electronic technician for the Canadian Department of National Defense. His hobbies include amateur radio, programming and more recently, cryptology.

32K ECB 16K Mod

(Plain text: Numerical text + Random key = Cipher text)

Keep	All	Messages	Secret
75-69-69-80	65-76-76	77-69-83-83-65-71-69-83	83-69-67-82-69-84
+ 08-05-12-10	14-09-06	13-02-15-10-04-08-15-12	06-09-02-11-07-01
= 83-74-81-90	79-85-82	90-71-98-93-69-79-84-95	89-78-69-93-76-85

Figure 1: Creation of Cipher text

knowns, for which there is no unique solution. Without a copy of the original random key, theoretically it is impossible to decode the text.

The One-Time Pad

Random keys for this system are distributed in the form of pads. Each pad contains a predetermined number of sheets. Each sheet is filled with randomly generated numbers, and no two sheets have the same number sequence. Each pad has an exact duplicate, both forming a pair, and no pair duplicates any other pair. Two people who share a pair of identical pads can communicate secretly with each other by using a different sheet for every message, tearing off that sheet when they are finished, and never using that same sheet again (thus the name one-time pad).

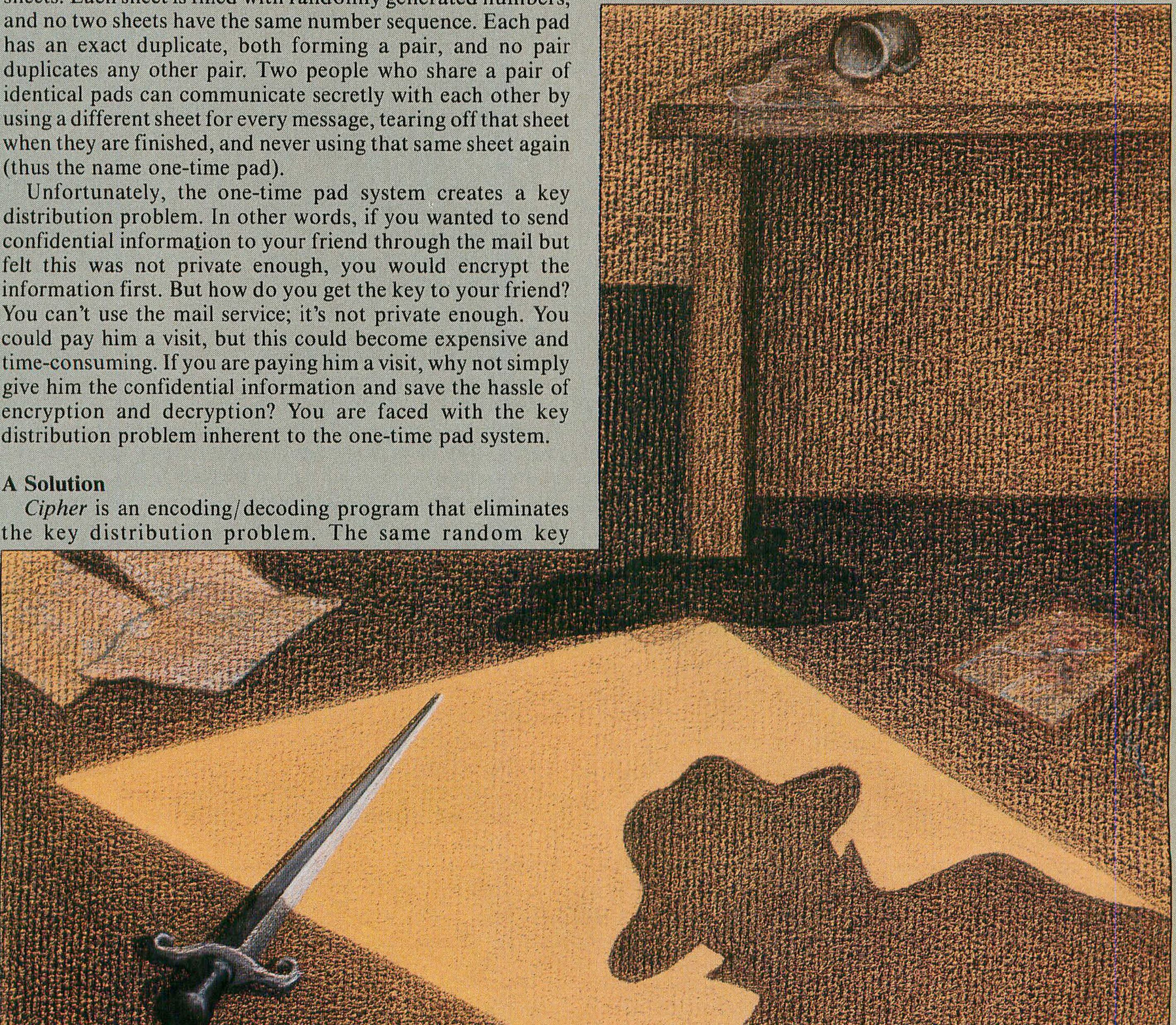
Unfortunately, the one-time pad system creates a key distribution problem. In other words, if you wanted to send confidential information to your friend through the mail but felt this was not private enough, you would encrypt the information first. But how do you get the key to your friend? You can't use the mail service; it's not private enough. You could pay him a visit, but this could become expensive and time-consuming. If you are paying him a visit, why not simply give him the confidential information and save the hassle of encryption and decryption? You are faced with the key distribution problem inherent to the one-time pad system.

A Solution

Cipher is an encoding/decoding program that eliminates the key distribution problem. The same random key generated by the encoding computer, is duplicated by the decoding computer. All that is needed is a password previously agreed upon by the corresponding parties. The password, or *keyword* as it is referred to in the program, can be any word or phrase of no more than 245 characters, including spaces. Every time the keyword is changed, the computer generates a new random number sequence. Changing only one character of the keyword will produce an entirely different Random key.

Program Operation

Cipher will operate on CoCos 1, 2 and 3, with 16K or more memory, on either tape or disk systems. Although a printer is not a necessity, it can be useful. After typing the listing, save it by using the command `CSAVE"CIPHER"` for tape or `SAVE"CIPHER"` for disk. If you are using a 16K tape system,



before loading you need to `PCLEAR 0` by typing `POKE25,6:NEW` and pressing ENTER. Also after the program is loaded, change Line 130 to `CLEAR 4000` instead of `8000` and `DIMP$(109)` instead of `(217)`. In Line 350, change `I=3456` to `I=1728`, and in Line 1730, change `I=6912` to `I=3456`. You are now ready to run the program.

At the start of the program, you will be presented with the title page and asked if you want to encode or decode. Answering the various prompts takes you through a series of easily-followed menus until you have completely encoded or decoded a message. The final work can be sent to the screen, recorded on tape or disk, or sent to the printer.

If you choose to encode a message, you will be placed in the word-processing mode, which allows you to type the uncoded text (lines 350 to 540). A number appearing in the upper-right corner of your screen indicates the amount of memory left in the buffer. When you type your text, only the alphabet (ASCII 65-90), comma, period, space and apostrophe are recognized as valid characters. If you need to enter numbers, they must be spelled out as you do when writing a check.

When you finish entering the text, press the percent sign (%), and you will be prompted to enter a keyword of your choice. This will seed the computer's random generator, prior to generating the random key.

Whether you want to send the cipher text to screen or to another option, the encoding procedure is the same. Let's examine lines 760 to 970 for a description of how the plain text is changed into cipher text.

As demonstrated in our example, plain text must be transformed into numerical text. To do this, every letter of the plain text is converted to its ASCII equivalent (Line 770). Then the alphabet is separated from the punctuation marks (Line 780). For convenience and protection, the alphabet is inverted and moved down to the punctuation marks (Line 790). In this manner, the letter Z (ASCII 90) becomes number 47 and A (ASCII 65) becomes 72.

After each conversion of a plain text letter into a numerical equivalent, the result of `RND(27)` is added to it in Line 800. This process is repeated until every letter of the plain text is transformed into cipher text. The number 27 was chosen because when added to 72 (the highest numerical equivalent), it will not exceed 99, which keeps the cipher text in a two-digit number format.

Lines 810 to 880 assemble the cipher text into groups of five digits for presentation on the screen. Lines 890 and 900 are used to toggle the screen on and off. Lines 920 and 930 simply ensure that the cipher text will always end with a five-digit group.

Decoding the cipher text requires that the reverse procedure be applied. Study lines 2320 to 2380 to understand the mechanics of decoding.

The Random Key

Since computers have to rely on mathematical formulas to generate random numbers, the results can only mimic a true random sequence. Because of this shortcoming, a pseudo-random sequence can be duplicated on demand simply by seeding the random generator.

If you would like to prove this to yourself, turn off your computer, wait ten seconds, turn it on and enter the following line:

```
FOR X=1 TO 6: PRINT RND(100);: NEXT X
```

Copy down the numbers that were generated on your screen, turn the computer off for another ten seconds, and repeat the procedure. The same six numbers are generated in the same sequence.

Every time your computer is turned on from a cold start, the random generator is automatically seeded with the same numbers, causing the same sequence to be repeated. This seed occupies four bytes and can be peeked at locations 278 to 281. If we poke those locations with integers of our choosing (0 to 255), the random generator should generate a certain sequence of numbers that could be duplicated on demand. This random sequence would then become the random key needed to encode and decode our messages.

Instead of poking four separate locations in memory, the same results can be obtained by randomizing a negative integer in the form `A=RND(-n)`. The following one-line program demonstrates this:

```
10 A=RND(-1234): FOR X=1 TO 6: PRINT RND(25);:
NEXT X
```

Every time you run this program, the same six numbers will appear on the screen. Change the negative integer, and you get six new numbers. Changing the negative integer puts new values at locations 278 to 281, forcing the random generator to generate a new sequence of numbers.

Line 2640 asks you for the keyword that you and your friend have agreed upon. Lines 2660 to 2680 add up all the ASCII values of the keyword and put that value in Variable `F`. Variable `F` becomes the seed required to generate the random key (lines 580 and 2180).

Conclusion

Because I am not an expert in cryptology, it is difficult for me to assess the level of security offered by this program. Nevertheless, I am confident that all unauthorized persons trying to read your secret correspondence will have to spend many hours — perhaps days — before they can crack your code. Messages will be better protected if you change your keyword often. Remember that in the one-time pad system, a key is never used more than once.

This program should prove interesting if used on your favorite BBS, for it is very unlikely that anybody but your intended friends could read your mail. Although other people might have a copy of this program, your keyword makes yours a unique version. If in the process of playing with *Cipher*, you should become a crypto-nut, I recommend that you read David Kahn's *The Codebreakers* (MacMillan, 1967) available in most public libraries.

To those interested in experimenting with the principle of seeding, there are many open avenues such as encryption of data, games requiring preset randomization, educational programs where a randomized order of presentations has to be repeated for learning or checking purposes, etc. The rest is up to you. I'm looking forward to see programs making use of the seeding feature in coming issues of THE RAINBOW.

(Questions or comments about this program may be directed to the author at 3220 Quadra, Apt. 106, Victoria, BC, Canada V8X 1G3. Please include an SASE when requesting a reply. ☐

230	218	1730	145
450	117	1940	3
680	234	2130	4
920	64	2370	87
1110	228	2560	157
1300	189	2830	247
1510	44	END	214

The listing: `CIPHER`

```
10 '   **********************
20 '   *      C-I-P-H-E-R     *
30 '   *    BY C.BEDARD       *
40 '   *  106-3220 QUADRA     *
50 '   *   VICTORIA  B.C.     *
60 '   *  CANADA   V8X 1G3    *
70 '   * COPYRIGHT (C) 1986 *
80 '   **********************
90 '
100 '-------------------------
110 '    ***INITIALIZATION***
120 '-------------------------
130 CLEAR8000:DIMP$(217):Y=1:H=1
184:C$="DISK SYSTEM  NOT OPERATI
ONAL":E$="THE PRINTER IS OFF LIN
E"
140 '-------------------------
150 '       ***FIRST MENU***
160 '-------------------------
170 CLS:PRINT@39,CHR$(43)+STRING
$(15,CHR$(45))+CHR$(43)
180 PRINT@71,"+  C I P H E R  +"
190 PRINT@103,CHR$(43)+STRING$(1
5,CHR$(45))+CHR$(43)
200 PRINT@170,"THE  PSEUDO"
210 PRINT@200,CHR$(34)"ONE-TIME
 PAD"CHR$(34)
220 PRINT@261,STRING$(21,CHR$(42
))
230 PRINT@325,"WOULD YOU LIKE TO
...."
240 PRINT@395,"(E)NCODE"
250 PRINT@427,"(D)ECODE"
260 PRINT@459,"(Q)UIT"
270 EXEC44539:A$=INKEY$
280 IFA$<>"E"ANDA$<>"D"ANDA$<>"Q
"THEN270
290 IFA$="D"THEN1580
300 IFA$="Q"THENCLS:NEW
310 '-------------------------
320 '   ***INPUT PLAINTEXT***
330 '   *** FROM KEYBOARD ***
340 '-------------------------
350 CLS:I=3456:PRINT@36,"ENTER
PLAIN  TEXT  AND"
360 PRINT@68,"PRESS <%> WHEN FIN
ISHED"
370 PRINT@100,STRING$(23,CHR$(45
)):PRINT
380 M=PEEK(136):L=PEEK(137):PRIN
```

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```
T@26,I;:POKE136,M:POKE137,L
390 FORX=1TO15:A$=INKEY$
400 IFA$=""THENNEXTELSE450
410 POKE(H),95
420 FORX=1TO5:A$=INKEY$
430 IFA$=""THENNEXTELSE450
440 POKE(H),96:GOTO390
450 IFASC(A$)=8THENGOSUB2730:GOT
O380
460 IFASC(A$)=32ORASC(A$)=39ORAS
C(A$)=44ORASC(A$)=46THEN490
470 IFASC(A$)=37THENP$(Y)=P$(Y)+
A$:GOTO540
480 IFASC(A$)<65ORASC(A$)>90THEN
390
490 PRINTA$;:I=I-1:H=H+1:IFH=153
6THENH=1504
500 P$(Y)=P$(Y)+A$:C=C+1
510 IFC=32THENY=Y+1:C=0
520 IFI<>0THEN380
530 M=PEEK(136):L=PEEK(137):PRIN
T@26,I;:POKE136,M:POKE137,L:A$=C
HR$(37):GOTO470
540 GOSUB2630
550 '------------------------
560 '    ***SECOND MENU***
570 '------------------------
580 CLS:G=RND(-F)
590 PRINT@36,"OUTPUT CIPHERTEXT
TO...."
600 PRINT@68,STRING$(24,CHR$(45)
)
610 PRINT@139,"(S)CREEN"
620 PRINT@203,"(D)ISK"
630 PRINT@267,"(T)APE"
640 PRINT@331,"(P)RINTER"
650 PRINT@392,"OR (E)ND SESSION"
660 EXEC44539:A$=INKEY$
670 IFA$<>"D"ANDA$<>"T"ANDA$<>"P
"ANDA$<>"S"ANDA$<>"E"THEN660
680 IFA$="T"THEN1020
690 IFA$="D"THEN1210
700 IFA$="P"THEN1370
710 IFA$="E"THENCLS:RUN
720 '------------------------
730 ' ***OUTPUT CIPHERTEXT***
740 ' ***     TO SCREEN     ***
750 '------------------------
760 GOSUB2920:PRINT" ";:V=0:W=0:
FORX=1TOY:FORZ=1TOLEN(P$(X))
770 P=ASC(MID$(P$(X),Z,1))
780 IFP=32ORP=37ORP=39ORP=44ORP=
46THEN800
790 P=137-P
800 P=P+RND(27)
810 A$=MID$(STR$(P),2,1)
820 PRINTA$;:W=W+1
830 IFW=5THENPRINT" ";:W=0:V=V+1
840 IFV=5THENPRINT"  ";:V=0
850 A$=RIGHT$(STR$(P),1)
860 PRINTA$;:W=W+1
870 IFW=5THENPRINT" ";:W=0:V=V+1
880 IFV=5THENPRINT"  ";:V=0
890 B$=INKEY$:IF(B$)<>CHR$(32)TH
EN910
900 B$="":B$=INKEY$:IF(B$)<>CHR$
(32)THEN900:B$=""
910 NEXTZ:NEXTX
920 IFW=0ORW=5THEN940ELSEA$=STR$
(RND(9))
930 PRINTMID$(A$,2,1);:W=W+1:GOT
O920
940 PRINT:PRINT:PRINTSTRING$(7,C
HR$(32))+STRING$(17,CHR$(45))
950 PRINT"      TO RETURN TO ME
NU"
960 PRINT"          PRESS ANY KEY
":EXEC44539
970 GOTO580
980 '------------------------
990 ' ***OUTPUT CIPHERTEXT***
1000 ' ***      TO TAPE      ***
1010 '------------------------
1020 CLS:PRINT@34,"INSERT CASSET
TE IN RECORDER"
1030 PRINT@69,"PRESS <RECORD> BU
TTON"
1040 PRINT@99,"PRESS ANY KEY TO
CONTINUE"
1050 PRINT@131,STRING$(25,CHR$(4
5)):EXEC44539
1060 GOSUB2810:GOSUB3000:W=0:OPE
N"O",#-1,F$
1070 FORX=1TOY:FORZ=1TOLEN(P$(X)
)
1080 P=ASC(MID$(P$(X),Z,1))
1090 IFP=32ORP=37ORP=39ORP=44ORP
=46THEN1110
1100 P=137-P
1110 P=P+RND(27)
1120 T$=T$+RIGHT$(STR$(P),2):W=W
+1
1130 IFW=16THENPRINT#-1,T$:W=0:T
$=""
1140 NEXTZ:NEXTX
1150 PRINT#-1,T$
1160 CLOSE#-1:GOTO580
1170 '------------------------
1180 ' ***OUTPUT CIPHERTEXT***
1190 ' ***      TO DISK      ***
1200 '------------------------
1210 CLS:IFPEEK(49152)<>68THENFO
RA=1TO6:PRINT@226,C$:FORB=1TO300
:NEXTB:PRINT@226,"":FORB=1TO100:
NEXTB:NEXTA:GOTO580
1220 GOSUB2960:GOSUB2810:GOSUB30
00:W=0:OPEN"O",#1,F$+"/CFR"
1230 FORX=1TOY:FORZ=1TOLEN(P$(X)
)
1240 P=ASC(MID$(P$(X),Z,1))
1250 IFP=32ORP=37ORP=39ORP=44ORP
=46THEN1270
1260 P=137-P
1270 P=P+RND(27)
```

```
1280 D$=D$+RIGHT$(STR$(P),2):W=W
+1
1290 IFW=16THENPRINT#1,D$:W=0:D$
=""
1300 NEXTZ:NEXTX
1310 PRINT=1,D$
1320 CLOSE=1:GOTO580
1330 '-----------------------
1340 ' ***CUTPUT CIPHERTEXT***
1350 ' ***   TO  PRINTER   ***
1360 '-----------------------
1370 CLS:IFPEEK(65314)AND1THENFO
RA=1TO6:PRINT@228,E$:FORB=1TO300
:NEXTB:PRINT@228,"":FORB=1TO100:
NEXTB:NEXTA:GOTO580
1380 GOSUB2880:GOSUB3000:PRINT#-
2:PRINT#-2," ";:V=0:W=0:FORX=1TO
Y:FORZ=1TOLEN(P$(X))
1390 P=ASC(MID$(P$(X),Z,1))
1400 IFP=32ORP=37ORP=39ORP=44ORP
=46THEN1420
1410 P=137-P
1420 P=P+RND(27)
1430 A$=MID$(STR$(P),2,1)
1440 PRINT=-2,A$;:W=W+1
1450 IFW=5THENPRINT#-2," ";:W=0:
V=V+1
1460 IFV=13THENPRINT#-2,"    ";:V=
0
1470 A$=RIGHT$(STR$(P),1)
1480 PRINT=-2,A$;:W=W+1
1490 IFW=5THENPRINT#-2," ";:W=0:
V=V+1
1500 IFV=13THENPRINT#-2,"    ";:V=
0
1510 NEXTZ:NEXTX
1520 IFW=0ORW=5THEN1540ELSEA$=ST
R$(RND(9))
1530 PRINT=-2,MID$(A$,2,1);:W=W+
1:GOTO1520
1540 PRINT÷-2:PRINT#-2:GOTO580
1550 '----------------------
1560 '    ***THIRD MENU***
1570 '----------------------
1580 CLS:PRINT@36,"INPUT CIPHERT
EXT FROM..."
1590 PRINT@68,STRING$(24,CHR$(45
))
1600 PRINT@171,"(K)EYBOARD"
1610 PRINT@235,"(D)ISK"
1620 PRINT@299,"(T)APE"
1630 PRINT@360,"OR (E)ND SESSION
"
1640 EXEC44539:A$=INKEY$
1650 IFA$<>"K"ANDA$<>"D"ANDA$<>"
T"ANDA$<>"E"THEN1640
1660 IFA$="T"THEN1970
1670 IFA$="D"THEN2090
1680 IFA$="E"THENRUN
1690 '----------------------
1700 ' ***INPUT CIPHERTEXT***
1710 ' *** FROM  KEYBOARD ***
```

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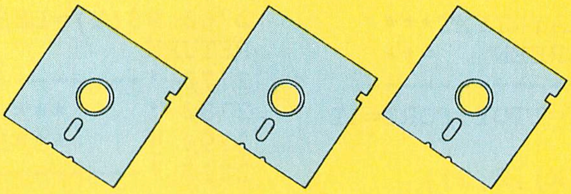
```
1720 '-----------------------
1730 CLS:I=6912:PRINT@36,"ENTER
 CIPHER TEXT AND"
1740 PRINT@68,"PRESS <%> WHEN FI
NISHED"
1750 PRINT@100,STRING$(23,CHR$(4
5)):PRINT
1760 M=PEEK(136):L=PEEK(137):PRI
NT@26,I;:POKE136,M:POKE137,L
1770 FORX=1TO15:A$=INKEY$
1780 IFA$=""THENNEXTELSE1830
1790 POKE(H),95
1800 FORX=1TO5:A$=INKEY$
1810 IFA$=""THENNEXTELSE1830
1820 POKE(H),96:GOTO1770
1830 IFASC(A$)=8THENGOSUB2730:GO
TO1760
1840 IFASC(A$)=32THENPRINTA$;:H=
H+1:GOTO1770
1850 IFASC(A$)=37THENP$(Y)=P$(Y)
+A$:GOTO1920
1860 IFASC(A$)<48ORASC(A$)>57THE
N1770
1870 PRINTA$;:I=I-1:H=H+1:IFH=15
36THENH=1504
1880 P$(Y)=P$(Y)+A$:C=C+1
1890 IFC=32THENY=Y+1:C=0
1900 IFI<>0THEN1760
1910 M=PEEK(136):L=PEEK(137):PRI
NT@26,I;:POKE136,M:POKE137,L:A$=
CHR$(37):GOTO1850
1920 GOSUB2630:GOTO2180
1930 '-----------------------
1940 ' ***INPUT CIPHERTEXT***
1950 ' ***    FROM  TAPE    ***
1960 '-----------------------
1970 CLS:PRINT@34,"INSERT CASSET
TE IN RECORDER"
1980 PRINT@70,"PRESS <PLAY> BUTT
ON"
1990 PRINT@99,"PRESS ANY KEY TO
CONTINUE"
2000 PRINT@131,STRING$(25,CHR$(4
5)):EXEC44539
2010 GOSUB2810:GOSUB3000:OPEN"I"
,#-1,F$
2020 IFEOF(-1)=-1THEN2040
2030 INPUT#-1,P$(Y):Y=Y+1:GOTO20
20
2040 CLOSE#-1:GOSUB2630:GOTO2180
2050 '-----------------------
2060 ' ***INPUT CIPHERTEXT***
2070 ' ***    FROM  DISK    ***
2080 '-----------------------
2090 CLS:IFPEEK(49152)<>68THENFO
RA=1TO6:PRINT@226,C$:FORB=1TO300
:NEXTB:PRINT@226,"":FORB=1TO100:
NEXTB:NEXTA:GOTO1580
2100 GOSUB2960:GOSUB2810:GOSUB30
00:OPEN"I",#1,F$+"/CFR"
2110 IFEOF(1)=-1THEN2140
2120 INPUT#1,P$(Y):Y=Y+1
```

```
2130 GOTO2110
2140 CLOSE#1:GOSUB2630
2150 '-------------------------
2160 '    ***FOURTH MENU***
2170 '-------------------------
2180 CLS:G=RND(-F)
2190 PRINT@37,"OUTPUT PLAINTEXT
TO..."
2200 PRINT@69,STRING$(22,CHR$(45
))
2210 PRINT@171,"(S)CREEN"
2220 PRINT@235,"(P)RINTER"
2230 PRINT@296,"OR (E)ND SESSION
"
2240 EXEC44539:A$=INKEY$
2250 IFA$<>"P"ANDA$<>"S"ANDA$<>"
E"THEN2240
2260 IFA$="P"THEN2500
2270 IFA$="E"THENRUN
2280 '------------------------
2290 ' ***OUTPUT PLAINTEXT***
2300 ' ***   TO  SCREEN   ***
2310 '------------------------
2320 GOSUB2920:FORX=1TOY:FORZ=1T
OLEN(P$(X))STEP2
2330 P=VAL(MID$(P$(X),Z,2))
2340 P=P-RND(27)
2350 IFP=32ORP=39ORP=44ORP=46THE
N2380
2360 IFP=37THEN2420
2370 P=137-P
2380 PRINTCHR$(P);
2390 B$=INKEY$:IF(B$)<>CHR$(32)T
HEN2410
2400 B$="":B$=INKEY$:IF(B$)<>CHR
$(32)THEN2400:B$=""
2410 NEXTZ:NEXTX
2420 PRINT:PRINT:PRINTSTRING$(7,
CHR$(32))+STRING$(17,CHR$(45))
2430 PRINT"       TO RETURN TO M
ENU"
2440 PRINT"         PRESS ANY KE
Y":EXEC44539
2450 GOTO2180
2460 '------------------------
2470 ' ***OUTPUT PLAINTEXT***
2480 ' ***   TO PRINTER   ***
2490 '------------------------
2500 CLS:IFPEEK(65314)AND1THENFO
RA=1TO6:PRINT@228,E$:FORB=1TO300
:NEXTB:PRINT@228,"":FORB=1TO100:
NEXTB:NEXTA:GOTO2180
2510 GOSUB2880:GOSUB3000:PRINT#-
2:FORX=1TOY:FORZ=1TOLEN(P$(X))ST
EP2
2520 P=VAL(MID$(P$(X),Z,2))
2530 P=P-RND(27)
2540 IFP=32ORP=39ORP=44ORP=46THE
N2570
2550 IFP=37THEN2590
2560 P=137-P
2570 PRINT#-2,CHR$(P);
```

```
2580 NEXTZ:NEXTX
2590 PRINT#-2:PRINT#-2:GOTO2180
2600 '-------------------------
2610 '  ***SEED SUBROUTINE***
2620 '-------------------------
2630 SOUND175,3
2640 PRINT:PRINT:INPUT" ENTER KE
YWORD";K$
2650 IFK$=""GOTO2640
2660 FORX=1TOLEN(K$)
2670 F=F+ASC(MID$(K$,X,1))
2680 NEXTX:RETURN
2690 '------------------------
2700 '    ***LEFT ARROW***
2710 '    ***SUBROUTINE***
2720 '------------------------
2730 IFC=0ANDY=1THENRETURN
2740 IFC=0THENY=Y-1:C=32
2750 POKE(H),96:C=C-1:H=H-1:PRIN
TA$;
2760 P$(Y)=LEFT$(P$(Y),C):I=I+1:
RETURN
2770 '-------------------------
2780 '    ***  SCREEN   ***
2790 '    ***SUBROUTINES***
2800 '-------------------------
2810 CLS:PRINT@38,"ENTER DATA FI
LE NAME"
2820 PRINT@70,"8-CHARACTERS OR L
ESS"
2830 PRINT@102,STRING$(20,CHR$(4
5)):PRINT:INPUTF$
2840 IFLEN(F$)>8THEN2810
2850 IFF$=""THENF$="CIPHER"
2860 RETURN
2870 '------------------------
2880 PRINT@36,"READY PRINTER AND
 PRESS"
2890 PRINT@68,"ANY KEY TO CONTIN
UE...."
2900 PRINT@100,STRING$(23,CHR$(4
5)):EXEC44539:RETURN
2910 '------------------------
2920 CLS:PRINT@35,"PRESS SPACE B
AR TO TOGGLE"
2930 PRINT@67,"SCREEN WRITING ON
 AND OFF"
2940 PRINT@99,STRING$(25,CHR$(45
)):PRINT:RETURN
2950 '------------------------
2960 PRINT@35,"INSERT WORK DISK
IN DRIVE"
2970 PRINT@67,"PRESS ANY KEY TO
CONTINUE"
2980 PRINT@99,STRING$(25,CHR$(45
)):EXEC44539:RETURN
2990 '------------------------
3000 PRINT@267,"WORKING...":RETU
RN
3010 '------------------------
3020 '  ***END OF PROGRAM***
3030 '------------------------
```

Utilize all of your CoCo 3's memory with these programs

Program a RAM Disk



By Daniel Jimenez

When you got your CoCo 3, you may have been disappointed to find that you still only use 30K of memory from BASIC. You probably wondered about the usefulness of 128K if you can't access it easily. You can easily use all that memory like a disk drive though, by using a RAM disk.

A RAM disk uses your computer's extra memory as if it were another disk drive. It uses your extra RAM (Random Access Memory) instead of floppy disks. With a RAM disk, you can `OPEN`, `CLOSE`, `KILL`, `DIR`, `PRINT#`, `INPUT` — and almost anything you would normally do with a floppy disk drive. RAM disks are also faster than floppies because the computer doesn't have to turn on a disk drive and search for the right place on the disk before information can be exchanged.

Most RAM disks are only available for 512K CoCos at a high price (higher than you paid to read this article). I offer an alternative.

Daniel Jimenez is a computer science major at the University of Texas at San Antonio. His favorite hobby is doing systems programming on the CoCo. He is especially interested in memory management-type programs, such as the RAM Disk.

RAMDisk installs a RAM disk in your 128K CoCo 3. To use it, you need a 128K CoCo 3 with at least one floppy disk drive and Disk BASIC. Type in and run Listing 1, `RAMDISK`. If "Checksum Error" is printed while running, go back and check the program's `DATA` statements. If the program is correct, you will be prompted for the drive number. For now press 1 and ENTER. You can choose any of the possible CoCo drive numbers (zero through three), but you will still want to be able to use your disk drive(s). When choosing a number for your disk, choose a drive number you don't have. After you type the appropriate drive number and press ENTER, the program will install and format a RAM disk and report which drive number is being used for it.

Now type `DIR1` and press ENTER. As no files exist on the RAM disk, you should see a blank line. Type `SAVE "RAMDISK:1"` and press ENTER. You have just saved a program on your RAM disk. Type `DIR1`, and the program will appear in a directory listing.

Experiment with it. You can use almost any of the commands available to Disk BASIC with your RAM disk.

What's the catch? A floppy disk can hold 160K of information, *RAMDisk* cannot. Of the 128K in your CoCo, 64K is taken up by BASIC and any variables or programs you have loaded into memory. *RAMDisk* uses the other 64K. This means that it can only hold 27 granules (64 times 1,024 bytes divided by 2,304 bytes per granule, minus about 4,000 bytes for the directory) in files. You can check this by using the `FREE` function. (For example, if you chose drive 1, type `PRINT FREE(1)` and press ENTER.)

If you have a 128K computer (as opposed to 512K), *RAMDisk* will use the memory that BASIC uses for `WIDTH 40`, `WIDTH 80`, and any of the `HSCREEN` graphics. Try not to use these features when the program is installed, or you may run into some major problems (like losing everything on the RAM disk). These limitations do not apply to 512K CoCos, but if you have a 512K CoCo, you ought to buy a RAM disk that can take advantage of all the memory.

Since *RAMDisk* does not have the

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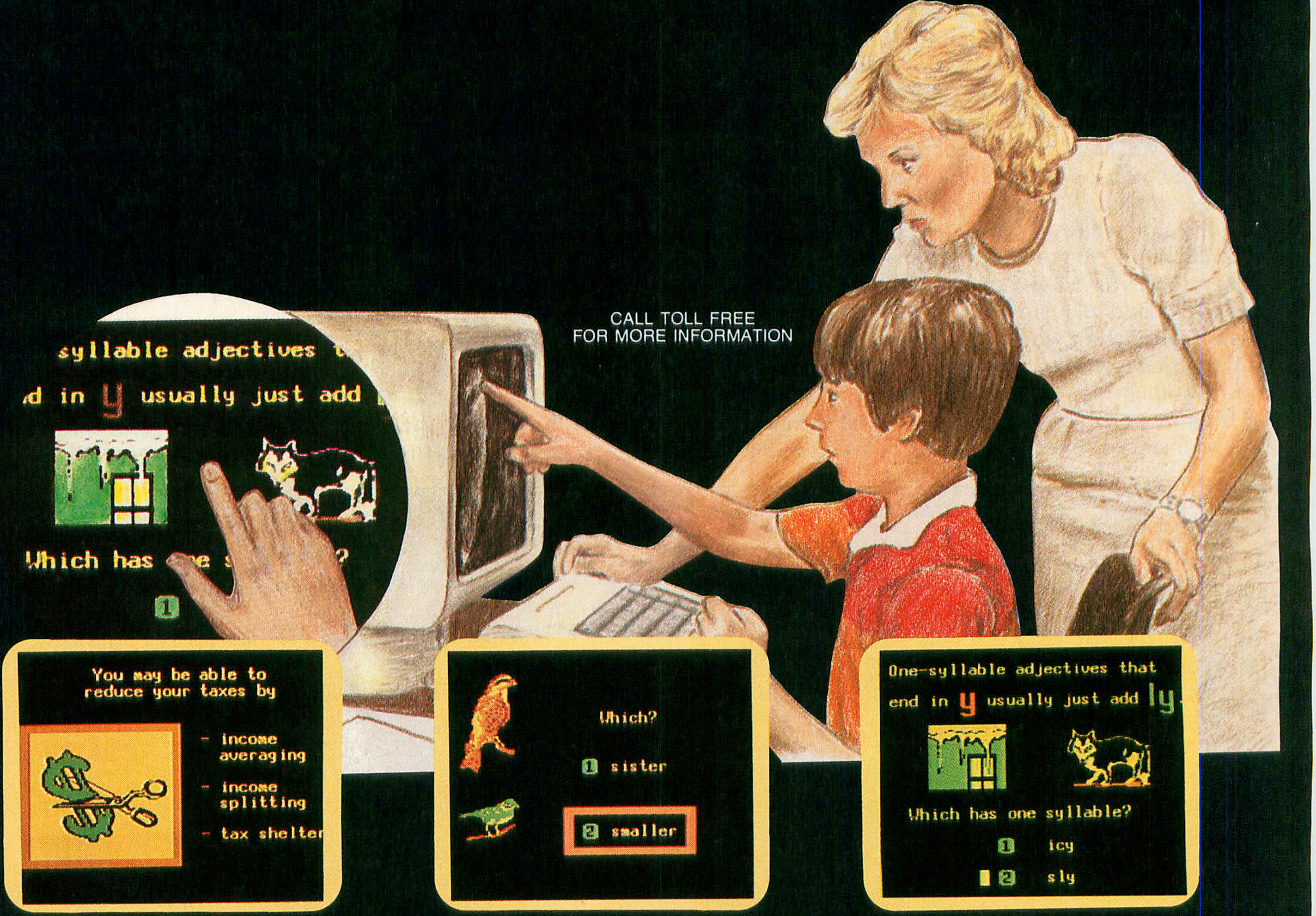

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memory of a normal disk, do not use the commands `BACKUP` or `DSKINI`. Of course, `BACKUP` and `DSKINI` will work with any drive number not being used by the program. You can use `DSKO$` and `DSKI$`, but don't specify any track number higher than 31 or lower than 17. The RAM disk doesn't have these, but it may look for them, which will cause problems. You can examine the directory and file allocation table sectors on Track 17 just like you would normally.

Since you can't use the `BACKUP` command with this program, I have included a program called *Copy* (Listing 2), which will copy all the files from one disk drive to another. It will work whether or not *RAMDisk* is installed (as long as you have two disk drives) but is quite useful. You can copy a complete disk into the RAM disk, work with the programs and files now on the RAM disk faster than you would with a floppy, and use it to copy all the files onto another floppy when you are done.

Because *RAMDisk* is completely in RAM memory, turning off your computer will erase everything on the RAM disk. Pressing RESET will not affect the program's operation.

Remember the high-speed poke (`POKE 65497,0`) for the CoCo 3, and how using it sometimes garbles your disks? When using the program, you can use the high speed poke with no change in operation except that the RAM disk will work twice as fast. Remember to go back to normal speed (`POKE 65496,0`) when working with any other drive.

For you hackers, here is some technical information: The RAM disk occupies virtual memory from address $60000 to $6FFFF ($0 to $FFFF for a 512K CoCo). It has 14 tracks numbered from 17 to 31, with 18 sectors per track and the directory and file allocation table on Track 17, just like a regular floppy. Sector 1 of Track 17 starts at virtual address $60000; so Sector 2 of Track 17 is at $60100; Sector three at $60200, etc. Therefore, you can modify these sectors byte by byte with the `LPOKE` command. The *RAMDisk* program resides in memory from $7EOO to $7F57, and hooks into the `DSKCON` subroutine at $C004, so you can use it from machine language by calling `DSKCON` just like you would in any other drive.

RAMDisk should work with all the CoCo 3 programs that play by the above rules; don't use memory from $7E00 to $7F57; don't modify the `DSKCON` subroutine; and don't use virtual memory. It would be perfect for programs written for the CoCo 2 running on the CoCo 3.

I'll leave you with this thought: Try to think of the RAM disk as a temporary storage device, like a variable, where you can do a large amount of work quickly and then copy your final result to floppy disk.

(Questions or comments concerning this program may be directed to the author at 3600 Falls Creed, San Antonio, TX 78230. Please include an SASE when requesting a reply.) ☐

Listing 1: RAMDISK

```
 10 'RAMDISK.BAS
 20 'COPYRIGHT (C) 1988
 30 'BY DANIEL JIMENEZ
 40 '3600 FALLS CREEK
 50 'SAN ANTONIO, TX 78230
 60 CLEAR 200,&H7DFF
 70 C=0
 80 FOR X=&H7E00 TO &H7F75
 90 READ A$
 100 A=VAL("&H"+A$)
 110 C=C+A
 120 POKE X,A
 130 NEXT X
 140 IF C<>41025 THEN PRINT"CHECK
 SUM ERROR.":END
 150 DEF USR0=&H7E00
 160 INPUT"DRIVE NUMBER";B
 170 A=USR0(B)
 180 END
 190 DATA 9E,72,8C,7E,7A,26,E,8E,
 7F,3A
 200 DATA A6,80,27,6,AD,9F,A0,2,2
 0,F6
 210 DATA 39,BD,B3,ED,C4,3,F7,7E,
 8A,BE
 220 DATA C0,4,86,7E,A7,84,CC,7E,
 8C,ED
 230 DATA 1,30,4,BF,7E,99,B6,FF,A
 1,34
 240 DATA 2,7F,FF,A1,8E,21,0,6F,8
 0,8C
 250 DATA 22,0,25,F9,8E,21,21,86,
 FF,A7
 260 DATA 80,8C,21,3C,25,F9,8E,22
 ,0,A7
 270 DATA 80,8C,3F,FF,25,F9,35,2,
 B7,FF
 280 DATA A1,9E,72,BF,7E,88,8E,7E
 ,7A,9F
 290 DATA 72,8E,7F,56,BD,7E,A,B6,
 7E,8A
 300 DATA 8B,30,AD,9F,A0,2,8E,7F,
 73,7E
 310 DATA 7E,A,12,BE,C0,4,86,7E,A
 7,84
 320 DATA CC,7E,8C,ED,1,7E,AB,CD,
 0,0
 330 DATA B6,0,EB,B1,7E,8A,27,7,3
 4,76
 340 DATA 86,5,7E,D7,63,34,76,F,F
 0,10
 350 DATA DF,0,10,CE,FE,F0,96,EA,
 27,9
 360 DATA 4A,27,6,4A,27,8,4A,27,3
 1,10
 370 DATA DE,0,35,F6,8D,52,DE,EE,
 10,8E
 380 DATA 1,0,FC,FF,A1,34,6,F6,7E
 ,8B
 390 DATA F7,FF,A1,5C,F7,FF,A2,A6
 ,80,34
 400 DATA 2,EC,61,FD,FF,A1,35,2,A
 7,C0
 410 DATA 31,3F,26,E5,32,62,20,CF
 ,8D,26
```

```
420 DATA DE,EE,10,8E,1,0,FC,FF,A
1,34
430 DATA 6,A6,C0,F6,7E,8B,F7,FF,
A1,5C
440 DATA F7,FF,A2,A7,80,EC,E4,FD
,FF,A1
450 DATA 31,3F,26,E9,32,62,20,A7
,8E,0
460 DATA 0,96,EC,80,11,27,7,30,8
9,12
470 DATA 0,4A,20,F7,34,10,96,ED,
80,1
480 DATA 5F,E3,E1,34,2,44,44,44,
44,44
490 DATA B7,7E,8B,35,2,84,1F,1F,
1,30
500 DATA 89,20,0,39,52,41,4D,20,
44,49
510 DATA 53,4B,20,41,4C,52,45,41
,44,59
520 DATA 20,49,4E,53,54,41,4C,4C
,45,44
530 DATA 2E,0,52,41,4D,20,44,49,
53,4B
540 DATA 20,49,4E,53,54,41,4C,4C
,45,44
550 DATA 20,41,53,20,44,52,49,56
,45,20
560 DATA 0,2E,D,0
```

Listing 2: COPY

```
10 CLEAR 2000
20 INPUT"SOURCE DRIVE";SO
30 INPUT"TARGET DRIVE";OB
40 SC=3
50 FL=0
60 F=-1
70 IF F=0 THEN 190
80 DSKI$ SO,17,SC,A$(1),A$(2)
90 FOR X=1 TO 2
100 A$=A$(X)
110 FOR Y=1 TO 128 STEP 32
120 T$=MID$(A$,Y,8)+"."+MID$(A$,
Y+8,3)
130 IF MID$(T$,1,1)=CHR$(255) TH
EN F=0:GOTO 150
140 IF MID$(T$,1,1)<>CHR$(0) THE
N PRINT"COPYING ";T$:COPY T$+":"
+MID$(STR$(SO),2) TO T$+":"+MID$
(STR$(OB),2):FL=FL+1
150 NEXT Y
160 NEXT X
170 SC=SC+1
180 GOTO 70
190 PRINT FL;"FILES COPIED."
```

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Features, guides and games on Delphi

Who Has the Time?

By Don Hutchison
CoCo SIG Database Manager

Starting a new year is always exciting. It's a time for figuring out what we did right or wrong during the year, and deciding what we can do to make things better during the new year. Many people find that the areas of time scheduling and time management usually need improvement. All of us want extra time to do the things that we must do and do the things that we want to do. Let's take a quick look at a few ways Delphi can help you use your time more efficiently.

Scheduler and Diary Software

Many people have asked about the Diary and Appointment-Scheduler features of the conference software. The Diary feature is fairly self-explanatory, but the Appointment Scheduler deserves some mention. I use the scheduler to remind me about family members' birthdays, dentist appointments, car maintenance items and other important dates. I just enter the date, a time and some sort of a memory jogger. The system will do the rest — it will remember the important dates for you.

When I log onto Delphi, the Appointment Scheduler will tell me if I have appointments that day. This happens in much the same way that a user is notified about waiting Mail. Just enter the Conference area to check your personal appointment scheduling system.

To get to the appointment scheduler, type `/DI` from the conference prompt, and type `APPOINT` at the scheduler prompt to get to your personal appointment scheduler. Follow the menus to add, delete or list your personal appointments. You may even create appointment entries for the next few years if you want.

To access the diary portion of the scheduler, type `DIARY` at the scheduler prompt. From there, you may add, delete or list diary entries just as you would do in a written diary. The diary software will ask for a date and then allow you to type in the diary entry. When finished, press CTRL-Z; the system tells you that your entry was successful.

To list a diary entry, enter `LIST` at the diary prompt. You'll be asked for a date, then the diary entry for that date will be displayed on your screen.

The data files for both the scheduler and diary functions of the SIG software are stored in your private workspace, making them accessible only to you. You may use Delphi's Mail feature to send these files to another person, but they remain private and inaccessible unless *you* choose to reveal their contents to another.

Ordering Delphi Information

Delphi offers two primary references for its users: a complete, bound guide to the service, and a command card. To order either one of these references, type: `Go Using Manuals`. You'll be able to choose between either of the two sources from the menu there.

Delphi: The Official Guide, by Michael A. Banks (KZIN) is a hard-bound, 500-page book designed to get you "up and running" on Delphi and to serve as a reference source. In its pages, you'll find everything you need to know to get the most from your time on Delphi. *Delphi: The Official Guide*, is a Brady Book, published by Prentice Hall Press. It is a complete resource for Delphi services. The manual includes descriptions of menus, time-saving tips for the advanced user, an index of Delphi services, a Dial-Up Guide, a technical reference section, a trouble-shooting guide, a glossary of terms and a Command Reference Card.

You can order this reference book for $19.95 plus $3 S/H. You may also

---

Don Hutchison is an electrical engineer and lives in Atlanta, Georgia. He works as a senior project engineer involved in the design of industrial control systems. On Delphi, Don is the Database Manager of the RAINBOW CoCo SIG. His Delphi username is DONHUTCHISON.

Database Report

This was an interesting month for us online in the RAINBOW CoCo SIG. If RAINBOWfest weren't enough, we also began developing our own CoCo *virus* online. Join us online as we playfully generate our own, special *benign* version of a Trojan horse. It promises to be interesting.

Let's take a look at the programs and information uploaded to the RAINBOW CoCo SIG this month:

OS-9 Online

In the General topic area, **Roger Krupski** (HARDWAREHACK) posted an overview of the SCSI standard for hard drive systems. **Marty Goodman** (MARTYGOODMAN) posted a reply from the RAINBOW SIG staff on Delphi to some statements made in Dale Puckett's October RAINBOW column (Page 14) regarding the use of CoCoBin on Delphi. **Steve Clark** (STEVECLARK) posted some shell scripts in the Applications topic, and **Marc Genois** (MARCGENOIS) uploaded Version 2.0 of *Shell+*.

In the Utilities topic, **Roger Smith** (SMUDGER) sent us his utility for deleting files from a directory without deleting the directory itself. While **Mike Huskey** (KINGTRENT) uploaded a set of fast RAM disk utilities, **Bruce Isted** (BRUCEISTED) uploaded revised versions of Bob Santy's PC-to-OS-9 file transfer utilities. Bruce also posted a file descriptor editor, a disk sector tester and a boot file link utility. **Jim Hollier** (PGJIM) uploaded a set of utilities to aid aspiring programmers in conceptual programming. **Merle Kemmerly** (TOOK3) sent us his text file dump utility and a program similar to `PROCS`, which gives information about a process. Finally, **Eric Crichlow** (HYPERTE) posted *ShellMate*, a directory utility.

The Patches topic includes Roger

purchase *The Guide* at many fine bookstores including B. Dalton, Coles and Waldenbooks. The book will quickly pay for itself in reduced online charges since you'll be able to research most items offline, then go directly to the places of interest to you.

In addition to *The Guide*, another reference source, the Delphi Command Card, is available for $2 from Delphi. This card is a handy reference for getting around on Delphi. The command card lists the major features and services of Delphi in a condensed format. While the card is intended as a quick reference vehicle for experienced users, it is an ideal tool for all Delphi telecommunicators.

Playing *Scramble*

The *Scramble* word game, introduced in the conference area of Delphi a few months ago, has proved to be a very popular real-time, multiuser game. Masquerading under the username of GAME in the conference area of the CoCo SIG, the *Scramble* game is instantly available to all CoCo SIG users. Enter the conference area, then join the group containing user GAME. You'll be greeted with a short introductory message about the main features of the game software, then told that entering the command GO will activate a 90-second round of *Scramble*.

> ***"The Scramble word game has proved to be a very popular real-time, multiuser game."***

Once you start a game, you'll have 90 seconds to make as many words as you can out of the 16 letters provided. Press RETURN to rescramble the same letters or to see them again if they scroll off the screen. Doing this usually results in more exciting games since the available letters are displayed in a different order, so users are allowed to gain a fresh perspective on available letter combinations. The longer the length of your words, the higher their point value. For example, three-letter words are worth nine points, five-letter words are valued at 25 points, eight-letter words are valued at 64 points, and so on.

Use the /TOP command to see the top scores and /RECENT to see the recent scores. Be wary of SIG members like manager Jim Reed (JIMREED), Belinda Kirby (KIRBY), John Lancas (DUSTIN), Art Flexser (ARTFLEXSER) and Bob Fried (FRIED). These people are walking dictionaries with high *Scramble* scores to prove it.

When you have finished playing *Scramble*, press CTRL-Z to exit from the game area. I think you'll enjoy *Scramble*, so please give it a try. In addition to increasing your word power, *Scramble* is an outstanding way to meet other Delphi users.

Season's Greetings from those of us on Delphi. ☐

Smith, who uploaded a patch for the DCheck module and **Chris Burke** (COCOXT), who posted the details of some improvements in the CLS and PALETTE commands for RSB users.

Tim Koonce (TIMKOONCE) presented an interesting history of the evolution of file transfer protocols in the Telcom topic. **Bill Brady** (OS9UGED) posted *WIZ Professional* as well as some updates to it.

In the Graphics & Music topic, **Glen Hathaway** (HATHAWAY) uploaded three archived pictures, and **Ken Groen** (4GILLIGAN2) posted a collection of several VEF pictures.

Finally, in the Programmers Den topic, Chris Burke uploaded an experimental source archive program.

CoCo SIG

In the General topic area, **James Wilcox** (2USER) provided a humorous text file describing the results of a "hairy" census, and **Joe M. Villarreal** (VILLARREAL) uploaded his thoughts on the Commodore computer.

David Mills (DAVIDMILLS) posted another nude freehand drawing from Brad Bansner in the CoCo 3 Graphics topic area. **James Farmer** (MODEMMASTER) posted many digitized shots of the successful launch and landing of the space shuttle Discovery. I (DONHUTCHISON) uploaded the October '88 CoCo Gallery pictures, and **Bob Wharton** (BOBWHARTON) sent us more of his popular rock art drawings.

The Utilities & Applications topic area gave us **Zack Sessions** (ZACKSESSIONS), who posted a very complete mailing list manager for all CoCos. In addition, **Jim Hickle** (JIMHICKLE) sent us a driver for using a DMP-132 printer with Erik Gavriluk's MacIntosh picture viewer.

In the Hardware Hacking area, Marty Goodman uploaded a set of new fonts for the *Word Pack 1*. Marty also posted some valuable information about 28- and 32-pin chip pin-outs. In addition, **Donald Ricketts** (STEVEPDX) uploaded a text file containing some comments about the causes of certain disk crashes.

Kurt Stecco (HIGHRAILER) uploaded a patriotic program that draws an American flag in the Classic Graphics area.

The Music and Sound topic area gave us **Mike Stute** (GRIDBUG), who sent us a *Lyra* file called Alchemy, and **Mike Carey** (SPOOLFRAME), who posted his version of "Blue Tango."

In the Product Reviews and Announcement topic, Donald Ricketts uploaded a comparison of *VIP Writer 3* and Version 3.2 of *Word Power*. Roger Krupski provided us with a file containing commonly-asked questions about the RGB hard-drive system.

Finally, in the Data Communications area, **Jim Harrison** (JIMHARRISON) posted a customizing file to convert *AutoTerm* for use with RGB monitors. Tim Koonce posted the protocol specifications for the Zmodem and WXmodem protocols. Tim also provided us with his own version of the evolution of file transfer protocols in general. (Tim is a graduate student in computer science at UC-Berkeley.) **Ken Halter** (KENHALTER) uploaded a file containing some useful patches and KSMs for Version 6.1D of *AutoTerm*. **Daniel Poirier** (DIGITIZER) posted some WEFAX pictures of the earth as seen from a satellite.

That's it for this month. See you online on Delphi!

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In Quest of the Star Lord (CoCo III only) See Aug '88 review. This is **THE** graphics adventure for the CoCo III! Unparalleled 320 x 200 animated graphics will leave you gasping for more! You quest for the Phoenix Crossbow in this post-holocaust world of science and fantasy. Full **4 Disk sides** of mind-numbing adventure! Requires 128k CoCo III and Disk drive. **HINT SHEET** .... $3.95 (+ $1.00 S&H by itself) Disk $34.95

KUNG-FU DUDE (CoCo I/II/III) See Feb. '88 review. An exciting arcade game. The **BEST** karate game ever for the CoCo! Destroy opponents and evade obstacles as you grow ever closer to your ultimate objective! Spectacular graphics, sound effects, and animation! Requires 64k, Disk drive, and Joystick. Now displays color on CM8. Disk $24.95

PYRAMIX (CoCo III only) See Dec. '87 review. Brilliant colors, sharp graphics, and hot action in this 100% ML arcade game. You'll enjoy hopping Kubix around the pyramid, avoiding Kaderf, Smack, Smuck, & the Death Square! Disk .. $19.95

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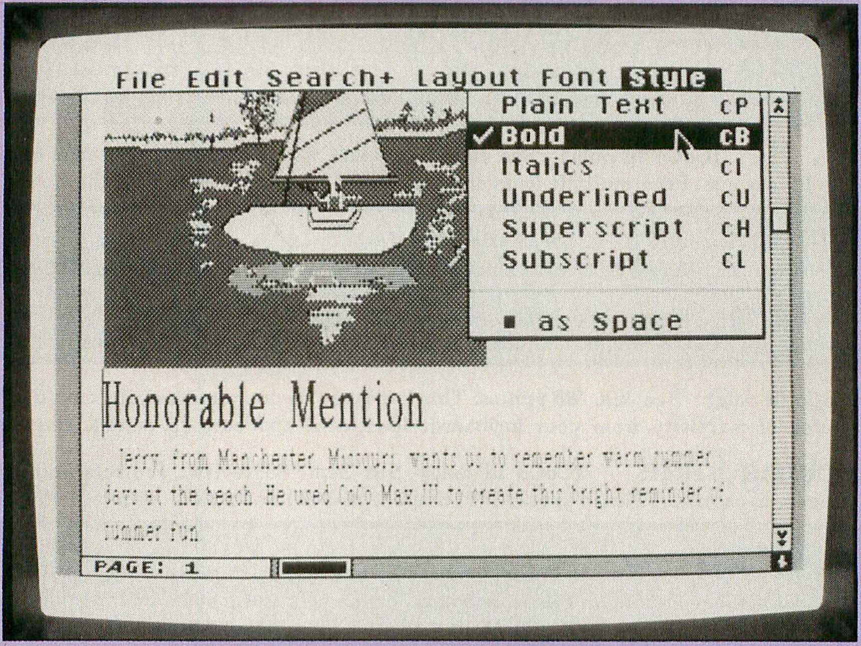


Honorable Mention

Jerry from Manchester Missouri wants us to remember warm summer days at the beach. He used CoCo Max III to create this bright reminder of summer fun

Software CoCo 3

Max-10 — A New Dimension in CoCo 3 Text/Graphics

Don't bother reading the last line of this review first. I'll tell you up front: If word processing is any measurable fraction of your usage of your Color Computer, give some serious consideration to buying *Max-10*, the only true "what you see is what you get" word processor available for the CoCo 3. Dave Stampe and Colorware have done an incredible job of providing power, flexibility and speed in a program that is as easy to use as it is to pronounce!

I have been using a wide arsenal of personal computers for many years, and what I do more of than anything else is prepare text. Memos, programs, training manuals, reviews for RAINBOW, and my feeble attempts at the Great American Novel have dribbled off my fingertips through a variety of word processors and text editors. *Max-10* takes a back seat to none, and is beyond comparison with most.

Max-10 operates through a combination of keyboard control and pull-down menus. This is not an easy combination to pull off. A good word processor should be easy to use, but I have found that if I can instinctively use every feature in a package, it is either inflexible, terribly light on features, or abysmally slow; sometimes all three. It is somehow comforting, then, to be able to use a new program extensively (and productively) without bothering with the manual, but knowing that some of its capabilities will remain a mystery without at least a little reading. *Max-10* succeeds in striking that balance.

To begin using *Max-10*, it is first necessary to install two special pieces of hardware that come with the package. The first of these is a Hi-Res joystick module, which plugs into the right joystick port. The joystick then plugs into the Hi-Res module. Once installed, it is easily forgotten, until you turn off *Max-10* and try to play a video game! Fortunately it is installed (or removed) in seconds, and provides for smooth and rapid cursor movement.

The other piece of hardware is the Clicker, which plugs into the cassette port. The Clicker serves as a hardware key, without which the program will not load. This enables the disk itself to be left free of annoying copy protection, which prevents the user from making a backup copy for personal use. The Clicker can be left installed as long as you don't need to use the cassette port; it has no effect on the operation of other software.

With the hardware in place and a backup copy of the master *Max-10* disk made, the next step is to run the CONFIG program in order to tailor *Max-10* to your hardware. This program can be run at any time, easily making changes to accommodate your hardware. The information requested includes monitor type, color set, clipboard drive, dictionary drive, printer baud rate and printer type.

The monitor type you enter can be either composite, RGB or monochrome. I ran *Max-10* with all three (simultaneously!) and found the display clear and readable with each. After entering the monitor type, you are shown the default screen colors and given the opportunity to adjust them to your own tastes. The actual palette values for both foreground and background colors are displayed on a corner of the screen; using the arrow keys, you can experiment with every possible combination. As you scroll through the numbers from 0 to 63, the screen display changes colors right along with you. I had lots of fun experimenting with this before finally deciding that the default black on white suits me best!

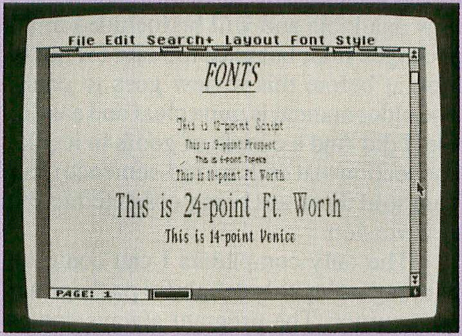
When editing text with *Max-10*, material can be "cut" from one part of a document and then "pasted" into another. When text is cut, it is stored on the "clipboard." The clipboard is in RAM when you're using a 512K CoCo 3 and on disk when system memory is 128K. The CONFIG program enables you to specify which disk drive will hold any material cut from the text. Even on a 512K system this is significant, as you can save the clipboard permanently, enabling you to paste it into any document at any time.

Similarly, the spelling checker allows you to permanently store personal dictionary files, and CONFIG asks which drive these should be on. Printer baud rate is prompted for next, followed by type of printer. *Max-10* has drivers for IBM/Epson compatible printers, DMP-105, 106 and 130, CGP-220, Gemini/Star and OKI92.

Once the CONFIG program is run, enter RUN"MAX" and immediately start entering text. Across the top of the screen is a menu bar, giving access to the following categories of commands: File, Edit, Search+, Layout, Font and Style.

The File menu provides a variety of functions for file manipulation. A new document can be initiated, an existing one loaded, or the current one saved. Straight ASCII saves and loads are supported, making it very easy to import any existing file into *Max-10*.

Also provided in the File menu are commands for seeing a directory of the current file drive (the drive being used to store documents), changing the file drive, printing the current document, and deleting a file from the file drive. This last function is one that is enormously useful — and painfully absent from many other word processors.



FONTS

This is 24-point Ft. Worth

This is 14-point Venice

A number of the menu selections result in a "dialog box" appearing on the screen, which enables you to enter additional information required by that command. The print command is an example of this, as it asks you to indicate what print mode to use. Having only one type of printer, I don't know if this particular dialog box looks different for other system configurations, but with my DMP-130 it gives me a choice of four different print modes, from draft to full graphic output. All modes functioned beautifully.

The Edit menu gives access to cut, copy and paste functions, as well as several commands for accessing and manipulating the clipboard. Also provided is the ability to paste an entire existing file into the current file.

The Search+ menu includes searching and replacing commands, along with access to the spelling checker, key click enable/disable, and page preview, among others. Page preview is one of the most significant features of *Max-10*. It enables you to see each page as it will look when printed, prior to actual printing. The text itself is even legible in page preview when using some of the larger fonts. Even with small fonts it is easy to make out the context of the pages. Page preview is a tool that results directly in a great deal of saved paper and reduced frustrations, because it is not necessary to print the document to see what it looks like in total.

Another very nice feature accessed through the Search+ menu is called "About ...." It displays information about the size of the document being edited, in bytes, words, paragraphs and pages, and also indicates how much free RAM remains. This is another of those features I so often wish I had when using the Macin ... er, the computer I use at work.

The Layout menu contains commands pertaining to the physical orientation of the document. Page breaks can be inserted, page numbering specified and page headers and footers displayed and edited. Your document can be printed in one, two

From Joysticks to Word Processors

Founded some 12 years ago, Alpha Products came into being to fill a needed niche in the blossoming personal computer market, in the area of input and output devices. It was Alpha Products who developed and marketed the first (and for several years, the only) joystick for the TRS-80 Model I computer. From voice synthesizers to relay cards, the products have kept coming, and the "Amazing A-Bus" is among many currently offered for IBM, Apple, and, of course, Tandy computers.

It was with *CoCo Max* that the company made the leap to software, and Colorware was formed. Despite the success of *CoCo Max I, II* and *III*, there were originally no plans to pursue the software side of the business much further. But the concept of *Max-10* was a challenge, and the Colorware team took it up.

It was Dave Stampe, though, who carried the bulk of the project through many long nights, and over three years of development. Although similar in appearance, there was very little portable code that could be moved from *CoCo Max III* to *Max-10*, and almost everything had to be rewritten from scratch. Integrating the menus from the various modules was a major headache, and speed was constantly a concern. With the entire display done with bit-mapped graphics, every millisecond has meaning. Many perfectly good sections of code were rewritten to shave off excess execution time.

It is said that hard work is its own reward, but in this case, anyway, the rewards go beyond the feeling of accomplishment. *Max-10* is yet another example of the power and capabilities inherent in the Color Computer — provided there are talented people to draw them out. ☐

or three columns using the Define Columns command in the Layout menu. Setting up a multi-column document is quite simple, and it is lots of fun watching it come up in Page Preview.

> *"The Style menu lets you assign specific letter signs, such as bold, italics, or underlining, to selected areas of text."*

Another significant feature of *Max-10*, found in the Layout menu, is the "ruler." While editing text, a graphic ruler can be displayed above any selected position in the text. The ruler is used to specify things like line spacing, side margins, tab positioning and justification for all text immediately below the ruler to the end of the document, or to the next ruler. New rulers can be inserted as often as needed in order to have different structures in different paragraphs.

The Font menu presents a choice of six available fonts. For those of you new to word processing, a font is "a specific style in which letters, numbers and punctuation marks are drawn," according to the glossary in the *Max-10* manual. Additional fonts are available from Colorware and can easily be loaded into *Max-10*.

The Style menu lets you assign specific letter styles, such as bold, italics, or underlining, to selected areas of the text.

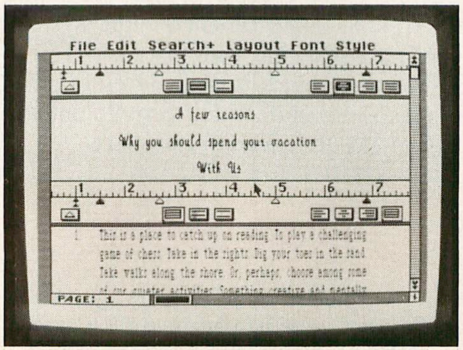
The features I've described so far are certainly sufficient to have earned *Max-10* a spot in the Word Processing Hall of Fame. However, the folks at Colorware were not content to stop there. They took it an extra step and built in the capability to paste graphics into the body of a document. A separate program on the *Max-10* disk is used to translate a picture from *CoCo Max I*, *II* or *III*, MSG, BASIC PMODE 4, or HSCREEN2 or 3 format into a file that can then be inserted in your document with the Paste File command.

The picture translation program provides abundant onscreen explanation of the process, and enables you to resize the picture, if you want, in order to fit it into the document.

I did have some difficulty in attempting to import a PMODE4 picture into *Max-10*, but the folks at Colorware were very helpful in putting me back on the right track. Once in the document, the picture can again be resized, and there is even a menu command that compensates for the difference in how graphic pixels are displayed and how they are printed, enabling you to see onscreen exactly what you'll see on paper.

My review copy of *Max-10* came with an older version of the manual and an addendum explaining the most recent features, the spelling checker and multi-column printing, as well as some minor changes in the menus. The updated manuals are now available and will be included in all packages sold, but alas, too late for me to look at before this review goes to press. The older manual is quite clear and easy to use. I did find a couple of goofs in it (like one section that ends in mid-sentence), but I am told these are being corrected in the new version.

The only complaints I can come up with regarding this delightful package are quite minor. The program always comes up with key-click enabled. While it is simple to turn off, it is a pain to have to do so every time, and I can't stand key click. The '+' in the Search+ menu appears to be a license to dump everything in there that doesn't have a home of its own. This is annoying for a while, then forgotten as you simply get used to it.



A few reasons

Why you should spend your vacation

With Us

The spelling checker, while very powerful and flexible, displays every word on the screen as it checks it. This lets you see that the program is actually working, but it also slows down what is already by necessity a slow process. Finally, in the picture translation program, there is no option in the main menu that takes you back to BASIC. Menus that won't let you out are a personal pet peeve of mine.

Despite these few little gripes, the bottom line on *Max-10* is this — buy it, you'll like it !

(Colorware, 242-W West Ave, Darien, CT 06820, 203-656-1806; $79.95)

—Jim K. Issel

Software CoCo 1, 2 & 3

MJK-DOS — A Different Environment

See pg 113

As we all know, OS-9 has become the reigning king of the CoCo 3, but let's not forget that Disk BASIC is out there for us basic BASIC nuts and beginners. If you fall into either one of these categories, *MJK-DOS* for the CoCo 1, 2 or 3 is just for you. It has everything you will need, whether you have a Color Computer 1 or a CoCo 3 with 512K, and it is an essential tool to help tame the CoCo beast.

MJK-DOS is provided with a well-written and easy-to-understand manual, though a complete list of commands can be obtained from within the program itself by typing HELP and pressing ENTER; this will provide you with a list of all the new commands and functions. I've fooled around with other disk operating systems since I've used CoCos, but none impressed me as much as *MJK-DOS* did — it takes your CoCo to a new level of versatility.

You can configure *MJK-DOS* to suit your system's needs, whether you have a CoCo 2 with a single-sided 35-track drive or a CoCo 3 with 512K and three double-sided 80-track drives. And with the 512K RAM disk installed, you could have up to a possible 2 Meg of online storage. With Global Kill, Copy and Wildcard directories, managing any disk system is a breeze.

The program is provided on a non-protected disk and is priced a little bit higher than competitive products, but not much higher. It's a small price to pay for the quality offered. As of right now, *MJK-DOS* is too large for any conventional EPROM, but the programmer is working on a board to put in the Multi-Pak Interface that will contain *MJK-DOS*. (If you send him a 24-pin or 28-pin EPROM, the programmer will send it back burned in with a small program that will auto-boot *MJK-DOS* from Drive 0 every time you turn on your machine.)

If you own a Color Computer 3 with 512K, count yourself lucky, because you get the best deal of them all. *MJK-DOS* for the CoCo 3 with 512K lets you use your extra memory as a RAM disk; it also has a very fine RAM test program installed within. But even if you don't have a CoCo 3, be satisfied, because there is plenty of great stuff in there for you.

The CHAIN command allows you to carry variables from one program to another, a feature excellent for running a BBS that uses several programs. The JOIN command allows you to join two or more lines within a program. A full-screen editor makes line editing easy, and a modified EDIT command makes line editing a simple chore.

But wait — there's more. A baud command allows a user-definable command to set the printer baud rate instead of your having to type POKE 150,*xx*. Auto line-numbering helps us BASIC programmers to write with ease. Also, a command has been added to view ASCII text files with just one simple command. Another new feature not found in the competition is the DATE$ command, which will support the *MJK* real-time hardware clock as advertised in the October '88 issue of THE RAINBOW.

Though instructions are not provided in the manual, the configuration program is well-written and fairly simple to use. You will be prompted with a brief set of instructions after running the program. If you have two double-sided drives and would like to make another device (Drive 4) as space for a RAM disk, it allows you to. You are also asked to specify a boot-up string that will be executed upon loading and executing *MJK-DOS*.

After receiving *MJK-DOS*, my Color Computer hasn't been quite the same. It's more powerful, has more features and now is easily more comparable to some IBM machines. Isn't that fantastic — our little Color Computers playing with the big boys! I cannot recommend this product strongly enough — especially if you have a CoCo 3.

(CoCo Connection, 5003 B St., Philadelphia, PA 19120, 215-457-1809; $49.95: First product review for this company appearing in THE RAINBOW.)

—Ed McCue

Software CoCo 1, 2 & 3

KDSK3 — CoCo 3 All-In-One Disk Utility

KDSK3 is everything you could want in a CoCo disk utility. It's a "menu-driven collection of disk utilities written exclusively for the Color Computer 3." From editing sectors to recovering crashed directories, *KDSK3* can do it. In addition to a CoCo 3, it requires at least one disk drive. An RGB monitor is highly recommended, as is a printer.

Upon loading, you are greeted with a title page that displays the purchaser's name and registration number. After pressing ENTER, you are presented with the main menu, which lists 24 choices. Selections are made by pressing the appropriate letter of your choice. Most functions work with Disk BASIC, Flex or MS-DOS disks, but not with OS-9. Here's an almost A to Z listing:

ASCII Dump — prints the contents of a specified sector to the screen in ASCII; non-ASCII characters are blanked out for easier reading. This option can be used to find keywords and commands in a file.

Backup — performs a complete or partial backup. The program will stop when it encounters I/O Errors, allowing you to note bad tracks and sectors. Backup can also be used to test disks for bad sectors.

Copy — makes copying multiple files a snap, and copies to "contiguous granules whenever possible." It works with single or multiple drives.

Dump Sector — displays a sector in ASCII and hexadecimal. Again, non-ASCII characters are blanked out.

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Edit Sector — allows easy editing (in hexadecimal). Users make changes by placing the cursor and typing in new data; the changes may be written to disk.

File Sort — sorts directory alphabetically and writes it back to disk; it supports Disk BASIC format only.

Granule Table — displays the granule allocation table in granules or tracks, and also shows the amount of free space remaining on the disk.

Hex Dump — prints a sector's contents to the screen in hexadecimal.

Initialize — initializes a disk, track or sector. It's useful in repairing a single sector, without rebuilding the rest of the disk.

Job — toggles among Disk BASIC, Flex or MS-DOS formats, for single- and double-sided disks. (*KDSK3* uses a unique drive numbering scheme to access the back side of a disk. Just add 4 to the physical drive number. For example, Drive 4 is the back side of Drive 0.)

Kill — allows easy deletion of one or more files.

Library — keeps track of all your files and information about those files (filename, extension, size, disk ID, write-protected status, ML addresses, etc.) in a master file, which can be sorted by disk, filename or extension. It includes a quick-find feature and can send results to the screen or the printer.

Mapped Directory — displays each file and its granule information.

Number Find — searches screen display for selected hexadecimal numbers (for use with Dump Sector, Edit Sector and Hex Dump).

Options — allows modifications to be made to screen colors, printer baud rate, disk drive step rate, regular or double speed, verify on/off, etc.

Password — encrypts and decrypts files with a keyword you provide.

Quit — returns the user to BASIC and removes the program from memory.

Recover Directory — recovers crashed directories (if first saved with the Save Directory option) and restores it to original location (Disk BASIC format only).

Save Directory — saves the directory in the upper half of the directory track.

Tracks — sets the maximum tracks and sectors that can be accessed by the disk drive.

Upload — transfers machine language or BASIC programs from tape to disk, displaying addresses.

View Directory — displays a disk directory five files across (Disk BASIC only).

Flex to RS — converts Flex files to Disk BASIC format.

Examine Track — displays an entire track of data, including control data.

In addition to the options that can be invoked from the main menu, *KDSK3* has some other commands: By using the SHIFT-CTRL combination, you can print whatever is on the screen; a press of the SHIFT-F1 combination will send a memo of up to 512 characters to the printer. F1 saves the current defaults of drives, baud rate, printer control codes, disk access rate, etc. F2 displays help screens that users can page through. On 512K CoCos, the help file will stay resident in memory after it is first loaded.

Also, *KDSK3* uses windows and is reset-protected. The program is set up initially for Star printers, but codes can easily be changed for any printer. Practically

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everything can be modified: the screen colors, printer baud rate, disk drive step rate, sides per disk, number of tracks per disk and clock speed. *KDSK3*'s manual is included on-disk. It's very helpful and easy to understand, taking the user step-by-step through each of the program's features.

Perhaps the best news about *KDSK3* is its price — only $15. Also, the program is distributed to registered owners of previous versions free of charge. *KDSK3* is my most-used utility. I think it will be yours, too.

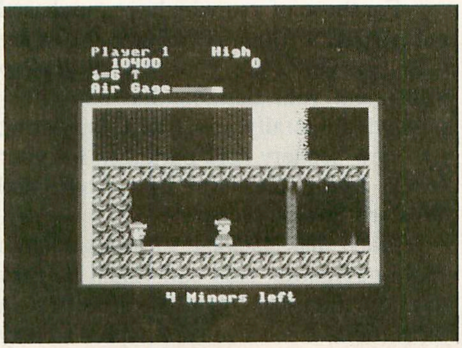
(Kenneth L. Wuelzer, 8535 Hwy. 291, Salida, CO 81201, 719-539-4724; $15: First product review for this company appearing in THE RAINBOW.)

—Lee Deuell

Software CoCo 3

Mine Rescue — Mission of Mercy

In *Mine Rescue,* an arcade game written by Steve Bjork, you are a rescuer and the last hope for miners who were overcome by poisonous air that leaked into the tunnels. The mission is to get a tank of fresh air to each of the trapped miners in a total of five mines. Each new mine you enter is more difficult to negotiate than the last.



You face a variety of obstacles, including bats, snails, falling icicles and acid, spiders, a banshee, and something that looks like a sloshy blue mop. Some of these creatures seem to have a homing signal on you and will track you down. The icicles hang quietly until they sense your presence, then they begin to loosen and fall — just make sure you're not under them when they do. Your defense consists of a miner's pike that you can throw.

Mine Rescue is booted by typing RUN"*". The screen prompts you for your monitor type, RGB or otherwise, then the title screen pops up.

In an options screen you can opt for the number of players (one or two), the level of difficulty (novice or expert) and the "controller type" (keyboard or left/right joystick). If you do not choose to either start the game or decide on some options, the program jumps into demo mode, from which it can be recalled with a key press.

You start the game by the mine shack, which is also your ending point — the place to which you will return when you have "rescued" all the miners in that level. If you attempt to go into the shack before you have rescued them all, you are told in no uncertain terms that you need to get back out there and finish the job. Don't think you'll get any sympathy — or extra air tanks.

You proceed into the mine tunnels using the joystick (or arrow keys) to maneuver the rescuer up and down ladders, over pits and other hazards. As you find the miners, you give them a bottle of air and continue the search until all of them are found. You then return to the mine shack before your own air runs out. You will find more bottles of air as you move about the tunnels, and you can use them to replenish your air supply.

The graphics are very sharp and action is smooth with joystick or keyboard. As you would expect, the joystick takes you left and right when you move it left and right. The rescuer jumps when you press the firebutton, and he crouches when you pull the joystick down (all the better to avoid flying bats). The playing screen

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appears as a window, which doesn't seem to take away anything from the game, but I *personally* prefer the playing area to be as large as possible.

I have been playing arcade-style games for many years and still do not consider myself an expert, but I had no trouble completing all five levels (mines) in the first few days on both novice and expert levels. With this in mind, I think the game probably would not be very challenging to the more advanced player. It would be excellent for beginning to intermediate level arcaders, however.

The documentation consists of a single, double-sided typewritten page. It does a fine job of explaining the features and operation of the game.

The style of the game seems very reminiscent of another program Bjork wrote recently for Activision, *Super Pitfall*. The goals of the two games are not the same, but both are very similar — hopping around in caverns, picking up "treasure," avoiding ugly monsters. The joystick action is similar. If you like the *Pitfall*-type programs, you should like *Mine Rescue*.

(Game Point Software, P.O. Box 6906, Burbank, CA 91510, 818-566-3571; $24.95 introductory special: First product review for this company appearing in THE RAINBOW.)

—Barry Pottinger

Software

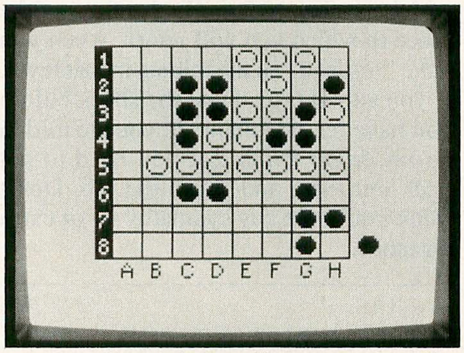
CoCo 1, 2 & 3

Good Games Trio — Computerized Board Games

As its name implies, *Good Games Trio* is a trio of games for the CoCo: *ADI*, *Othello* and *Connect Five*. You'll need an opponent, because these are two-player games. All are written in BASIC and can be backed up for safekeeping. 32K ECB is required to play.

ADI, an age-old game made popular in the African desert, was played originally with hardened chunks of camel dung! Fortunately, the author decided to clean up the game by providing what look like poker chips as viewed from the side. The Hi-Res playing screen is divided into six compartments, each containing four tokens. *ADI* is played by two people who take turns selecting any one compartment with the idea of distributing the chips in a clockwise direction around the board, placing one chip at a time until all are distributed.

In many cases, the last chip placed will land on your opponent's side of the board. If this compartment contains two or three chips once yours is added, then you get to capture the compartment. If the compartment counter-clockwise to the one you just captured contains two or three chips, it will be captured, as well. This continues until no more captures can be made and play is passed to your opponent.



Othello might be a little more familiar to CoCoists, as it is probably indigenous more to the closets of American (and Canadian) households than to the African desert. *Othello* is a two-player game in which opposing players place "tokens" on a grid in such a way as to "capture" their opponent's pieces.

Player 1 is assigned the white tokens, and Player 2 the black. The game begins with four tokens already placed in the center on an eight-by-eight grid, whose columns are lettered on the bottom and rows numbered on the side. Player 1 starts by pressing a letter (A through H) and then a number (1 to 8) to place a taken so that it is adjacent to an opposing token and in line with another of its own. When those conditions are met, any tokens of opposing color sandwiched between two of the current player's tokens are "captured." The captured tokens then take on the color of the tokens of the player who just did the capturing. Sound confusing? It's not.

The game is over when all the game pieces are converted to either one color or another, or when no more tokens can be placed. The player who conquered more squares wins.

The programmer states in the documentation that by making the game board smaller than "regulation" (eight-by-eight as opposed to 12-by-12), the game is shorter, more appropriate for tournaments, and left with "little or no room for mistakes." Also to help prevent mistakes is a nice bit of error-trapping: You cannot make an illegal move — cute sound effects advise you if you try.

Connect Five, the third and final installment to this trilogy, should be equally as familiar to CoCoists — especially those who were bored in school and frequently played the paper-and-pencil version. This computerized version saves you from having to draw the dots.

When you run CONNECT5, a 10-by-10 grid pops up, labeled on the bottom with the letters A through J. Press a letter key and a token of your color glides down, filling in the next available slot in that column. The player who succeeds in placing five of his or her tokens in a row diagonally, horizontally or vertically, wins.

Documentation on the trio is supplied on a single page, folded into a handy booklet. Also, there's a program called LOGBOOK on the disk, and it contains similar instruction, which can be LISTed on the screen or LLISTed to your printer.

Good Games Trio is a fine collection of games that runs nicely on my 64K CoCo 2 and on my 128K and 512K CoCo 3s.

(RCPierce Software, P.O. Box 1787, Main Post Office, Edmonton, AB, Canada T5J 2P2, 403-474-8435; $19.95)

—David Gerald

Software

CoCo 3

Flight Simulator Scenery Disks — Expanding Your Horizons

For those of you who have purchased subLOGIC's *Flight Simulator II* (Tandy Cat. No. 26-3242), you will be glad to know that your horizons have been expanded — literally. subLOGIC is offering two new scenery disk packages for your CoCo flying pleasure: East Coast and Western Europe scenery disks.

Each disk package includes enough radio-navigation aids and visual scenery to allow the user to navigate anywhere in the sectional areas covered. A typical scenery disk covers three aeronautical sections and includes approximately 100 airports and 100 radio-NAV aids. Instructions are provided in the documentation on how to read a sectional directory, which provides the user with a description of available airports and radio-NAV aids, etc.

The East Coast package covers the U.S. eastern seaboard, including Washington D.C., Charlotte, North Carolina, and Jacksonville and Miami, Florida. The Western European Tour covers the southern United Kingdom, northern France and southern West Germany. Both of these scenery disk packages are ready to run on your CoCo 3 with a minimum of 128K and the subLOGIC *Flight Simulator II* software.

On single-drive systems, the flight simulator is loaded in the usual way; but after the program has loaded and you are in the flight mode, you press F2 on the CoCo 3. At that point you remove the *FS2* disk and insert the appropriate scenery disk. You then press the left arrow key and ENTER. If necessary, position the right arrow to point at the desired scenery area of interest. After a very short time, the new scene will be loaded into memory and you press F2 again to get back to the flight mode. A similar method is used with dual-drive systems, but disk swapping is not necessary.

I found these scenery disks to be a very good complement to an already delightful *Flight Simulator II* package. In the Western European package, for instance, one is able to fly over such famous landmarks as Parliament, Buckingham Palace and Westminster Abbey. Other similar interests are provided in the portion for France and West Germany. You can even fly over Red Square in Moscow without getting arrested!

These scenery disks from subLOGIC are an excellent value for your money if you are really interested in flying. I showed these packages to a pilot friend of mine and he was impressed with the maps and navigational aids provided. These scenery disks, in conjunction with *Flight Simulator II*, provide flying opportunities that many small-plane pilots may never have.

(subLOGIC Corp., Champaign, IL: Available in Radio Shack stores nationwide; Western Europe and U.S. East Coast disks, $24.95 each)

—Jerry Semones

Software

CoCo 3

Armchair Admiral — Battleship Played Admirably

What naval battle game has withstood the test of time on toy store shelves longer than any other? I'm not sure, but I know that Battleship by Milton Bradley has been around about as long as I can remember. As it happens, I can remember a ways back.

Armchair Admiral, a first product from Eversoft Games, Ltd., brings a Battleship-style game to the CoCo 3. It comes on a single unprotected disk and consists of an eight-granule BASIC program. From the advance package and the Eversoft advertisement, it appears this game may be for disk owners only. My quick listing of the program did not immediately disclose any disk-specific commands, so you may want to contact Eversoft to see if it could be made available to cassette-based CoCoists.

A letter enclosed with the disk explained that the two-page, single-spaced printout of the rules was intended as a rough draft. Eversoft promises that a professionally rewritten and printed set of rules is expected soon. *Armchair Admiral* is easy and familiar, so I don't feel game play would be stymied either way. Perhaps Eversoft will consider leaving the instructions as an ASCII text file on the distribution disk. [*Editor's note: The documentation is finished and available now.*]

Armchair Admiral permits play for from two up to eight players. The way it is designed, it can be played as a single-player game also because it permits any or all of the selected eight players to be managed by either a person or the computer. I wondered what would happen if I

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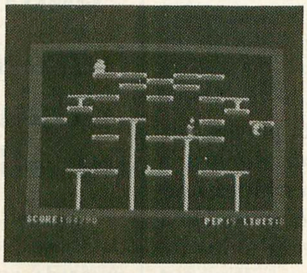

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selected the two-player game and let the computer move for both players. A sailin' it went, playing the entire game by itself. It was at that time I noticed that *Armchair Admiral* was not taking potshots. It was evident the computer was making intelligent moves in an attempt to win the game. A cute narrative accompanies the game board action.

> ***"I wondered what would happen if I selected the two-player game and let the computer move for both players. A sailin' it went, playing the entire game by itself."***

Just in case you've never played this style game before, *Armchair Admiral*'s rules are simple. Each player hides four ships on his map, which is composed of a 10-by-10 grid. When all players' ships are placed, each player takes turns calling out grid locations on another player's map. If the calling player is lucky enough to "fire" on a location where the other player has hidden a ship, the hidden ship sustains damage by taking a hit. Each player has four types of ships (sloop, caravel, brigantine and galleon), which can sustain damage ranging from two to five hits before being sunk. You win when all of the opposition's ships are sunk. About the only substantial change from the traditional format is that *Armchair Admiral* permits three shots per turn instead of one. This gives it a neat, broadside feel.

As *Armchair Admiral* is written for the CoCo 3, it's naturally got a lot of conveniences. For example, the computer will take the work out of hiding your ships by hiding them for you. And on any of your turns, you can call up a tally of hits or review the coordinates of previous hits. You can even drop out of the game at any time, letting the computer take over.

Armchair Admiral does not utilize graphics, but Eversoft has still added many niceties to the standard game. The ships are represented by letters (S for sloop, for example) and the map grid points by periods. The game screen is filled with pleasant, colorful windows that summarize the 13 available key commands or give status reports. Because *Armchair Admiral* uses 80 columns, high resolution and is exclusively text, it would be wise to consider how well your monitor can handle this type of display.

Overall, *Armchair Admiral* is a genial update of an old genre. The Battleship-type games are usually recommended as being for ages 8 through adult, and I would agree. *Armchair Admiral* is being offered for $14.95, and at that price it certainly makes an inexpensive addition to the Color Computer 3's available game software market and a swell gift for young admirals.

(Eversoft Games, Ltd, P.O. Box 3354, Arlington, WA 98223, 206-653-5263; $14.95 plus $2 S/H: First product review for this company appearing in THE RAINBOW.)

—Ernest F. Zore

Software CoCo 1, 2 & 3

Ultra-Base — A Database for All CoCos

Ultra-Base is a database program. And databases, as you know, provide a very versatile and easy way to keep track of information — names, addresses and telephone numbers are good examples of what can be stored. Databases can also be useful to keep track of information concerning items in an inventory or a household.

Ultra-Base can store up to 32K of information and works on all models of the CoCo, including the CoCo 3. The program is supplied on either disk or cassette and requires at least 64K of RAM. The program is written in BASIC but uses machine language routines to improve speed during sorting, searching and alphabetizing. The software is not copy-protected, so you can make some backup copies for safekeeping.

After the program loads, you are presented with the main menu, which displays a list of numbered commands that allow you to not only create your own customized database but to edit and maintain it, as well. A demo file included can be loaded and manipulated to your heart's content.

The first command, Search, lets you search your database to find out some particular item of interest. Edit Review is used to add or change entries, or just to quickly scan through a file in memory. (A couple of handy keys to use here are the '@' key to scan forward and the ':' key to scan backward. The '?' key is used to jump back and forth between the beginning and end of the file.)

Print provides a submenu from which you can dump an entire file or just selected parts to the printer. You can also select one-up mailing labels if you need to print them. Command 4, Load/Save, results in a submenu that provides for loading and saving to disk or tape.

The Append command lets you merge files. Assuming you have some data in memory, this command lets you combine files to create one long, single file. You can tell if you have enough room in memory by watching the free space indicator at the bottom of the main menu screen. The Alphabetize command does just what you'd think. You can alphabetize each entry by either the first or last word; this would be useful for names and cities and so forth. Positive Number Sort sorts by any of the categories you have previously established.

The eighth command, Edit Headings, lets you change the names of the categories, but Create File is where it all begins. It's simple to set up a database — you just answer prompts that establish the various categories.

Command 10, Clear Memory, clears memory of data but retains the latest category names. Delete Catalog erases all entries within the specified category, and Command 12, Quit, quits.

Ultra-Base incorporates another nice feature — BREAK recovery. Should you accidentally break out of the program, you can restart it without losing any of the data in memory by typing GOTO 7000. This can be a lifesaver for fumble-finger typists like myself.

Ultra-Base is a nice addition to any CoCo enthusiast's software library. It is user-friendly and easy to use once you master the program structure and the logic of the various commands. The price is very reasonable for a program of this caliber, and the program is sure to fit most user's applications.

(Tothian Software, Inc., Box 663, Rimersburg, PA 16248; $24.95)

—Jerry Semones

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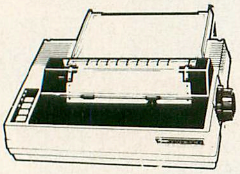

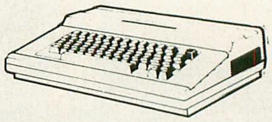

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Book

Security Projects for the TRS-80 Color Computer — CoCo Becomes Watchdog

Does your CoCo sit in silence most of the time? You know, after you're tired of playing the games and have finished all the word processing chores, does it just sit there gathering dust? Well, there may be something it can be doing while you're on vacation or at work or doing the household chores. How about turning your computer into a CoCo watchdog? Give your computer some teeth to do tedious chores like turning lights on and off at certain times, or setting off an alarm if someone enters a room or breaks into your home.

A new booklet on the market called *Security Projects for the TRS-80 Color Computer* explains how you can build the hardware interfaces for four security projects: a vacation light that monitors ambient light levels and turns a light source on or off according to detected levels; a temperature alarm that monitors temperature and sounds a buzzer when the preset temperature is reached; a sound-activated alarm that activates a local alarm when a sound is detected at a remote location; and an intrusion alarm that monitors doors and windows using magnetic switches to detect openings.

The booklet contains 21 pages of information, schematics and programs to develop these projects. The author assumes you are a hardware hacker — that is, that you know how to read schematics and build circuits from them correctly.

The booklet is easy reading and the programs all seem to work properly. Though I did not actually build any of the circuits, I did test all the programs included. The author makes use of the joystick ports as inputs and the cassette start/stop relay as the output.

With the exception of the intrusion alarm, the other projects are fairly simple and use only a handful of commonly available parts (e.g., resistors, capacitors, bridge rectifiers, etc.). If you have a pretty good junk box, you may already have these parts. If your resources are low or nonexistent, you can order most of the parts from your local Radio Shack store and the others from two mail order suppliers listed in the booklet.

All the projects use a step-down transformer to power them. If you're a fairly new hardware hacker, make sure you know how to safely handle 117 volts AC, and make darn sure you test the circuit fully before connecting anything to your CoCo.

I checked some of the schematics for accuracy, looking for things like the correct pinout on the ICs, polarities of the power supplies, etc., and they seem to be accurate. Since I didn't actually build the circuits (because my junk box is empty), I can't verify that each circuit is absolutely perfect. But an analysis of the circuits showed them to be reasonable, and they should work as shown.

The program listings are written in BASIC and, therefore, are easily modifiable to your special needs. They are very straightforward and have adequate comments. The longest program is only about 30 lines long and should fit in any CoCo configuration. I tested these programs on a CoCo 3.

If you are looking for some simple hardware projects to keep yourself busy this winter, you might want to buy *Security Projects for the TRS-80 Color Computer* and build a couple of these projects.

If you write checks, use credit cards, have a bank account or pay taxes, then....

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Remember, though, the directions assume a working knowledge of electronic circuit construction. You neophytes might want to start at your local library to get the basics of electronics before you attempt these projects.

(Brown's Enterprises, 119 Skyline Drive R.H., Granbury, TX 76048, 817-573-0037; $7.50: First product review for this company appearing in THE RAINBOW.)

— C.L. Pilipauskas

Software

CoCo 1, 2 & 3

Horse Sense — Help in Picking a Horse

"Which horse should I bet on?" Go to a thoroughbred racetrack and ask 10 different bettors — you're bound to get at least three different answers. Ask why and you'll probably get 10 different reasons. Some will talk about a horse's speed or a change in its equipment. Others will tell you about a change in trainers or how it raced last time (or the time before that). Still others may point to the horse's name, color or jockey.

All of these "systems" will occasionally choose the winner — and some will do better than others. If you get beyond making a bet based upon the horse's color, number or name, you will probably need to look at *The Daily Racing Form*, a newspaper-like publication that contains a detailed description of each horse on the racing program. Your first reaction to this seemingly endless amount of data might be this question: "Wouldn't it be great to put all this information into a computer and let it choose the winner?"

Computer programs that supposedly pick winners have been around almost as long as the computer itself. ("Hey, why don'tcha tell dat ting ta pick da winners?" as a Damon Runyon character might have put it. Not surprisingly, novelist Dick Francis, who often uses the racetrack as a backdrop for his best-selling mystery books, used a computer racing program as the focus of his 1982 novel *Twice Shy*.) To the list of racing computer programs, we can now add one designed for the Color Computer owner — *Horse Sense* by Western Hills Software.

The disk program loads easily and the instructions are clear, concise and helpful. After a simple graphic, the main menu lets you choose from Basic Instructions, Handicapping and Betting Tips or At the Post (where most of the work is done). "Basic Instructions" and written instructions explain how to enter data from *The Daily Racing Form* in the At the Post part of the program. (The instructions also explain how to read the form.)

The inputs in the At the Post section include two inputs that set up the race and at least 13 inputs for each horse. (The instruction sheet suggests, and my experience confirms, that you should use at least two races for each horse — thus you will enter at least 26 items for each horse.) Most of what you enter relates to the speed of the horse at various times in the its previous races. Based upon this data, the program computes a final rating. The instructions suggest that you bet the horse with the best rating.

How well does the program work? Most importantly, does it pick winners? I tried the program on a couple of racing programs at Philadelphia Park in early September. (The input of data does require a certain amount of time — it took me at least 15 minutes for each race. Since I am not quite ready to give up my regular job for either a life of gambling or reviewing software, my sample was limited by time constraints — an accurate test would have to include not only many more races but also different track conditions at different times of the year. It also would need to be tested at different racetracks.)

In my small sample, the program did choose some winners. Most of the winners, however, were among the betting favorites. A likely reason would be that the speed factors that would make a horse the computer's choice were also identifiable to any careful reader of *The Daily Racing Form*. (After a few races, I was often able to predict which horse the program would choose.)

Because a horse's speed as documented in its previous races is a major factor for many handicappers, it is not surprising that the program's choice was almost always one of the public's betting favorites. Betting on favorites, according to a number of statistical studies, is not a bad system to follow. Monetarily, you should lose less than if you consistently bet longshots or horses with funny names or whatever catches your fancy.

Showing a profit, however, will require a high success rate — something this program, by itself, may not be able to achieve. (The program's only guarantee is that "the program will load and run.") *Horse Sense* is dependent upon a horse's most recent races for its information. For some horses, that race may have occurred three or four months ago. The numbers from that race probably tell us very little about the horse's current condition. To use computer jargon — garbage in, garbage out.

Additionally, the program ignores other handicapping factors such as jockey, post position and track condition. For example, last week our horse had as his jockey a rider who hasn't won a race in two years. Today, the best jockey at the track is aboard. I think the horse's chances have greatly improved, yet the program's rating for the horse will stay the same.

For someone who is overwhelmed by the racing form or who seldom if ever picks a winner, this program might not be a bad investment. The speed ratings might also be of some interest to the experienced gambler as one more factor to consider in making a race choice. If you like thoroughbred racing, you may find this program of some value.

(Western Hills Software, 6133 Glenway Ave., Cincinnati, OH 45211, 513-662- 3999; $24.95 — specify tape or disk when ordering: First product review for this company appearing in THE RAINBOW.)

—John Matviko

Hardware

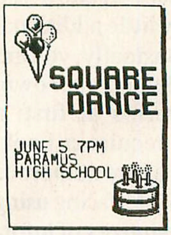
PIA and Extender Boards — The CoCo Real World Interface

Did you ever want to try your hand at interfacing your CoCo to the outside world? You know what I mean — build a parallel printer port, analog-to-digital converter, or some other more exotic device?

I've wanted to try my hand at interfacing for several years now and have been stopped more times than I want to admit. The usual hang-up is connecting the project to the CoCo. I've used extender cables and interfaced devices to the cassette and joystick ports, but the really interesting projects require that you build an extension of the 40-pin bus used by cartridges and program packs. Each time I started on such a project, I stopped short of completion either because I was afraid of damaging my computer or because I lost interest in all the required soldering.

If you're like me, you'll appreciate two products available from Fraser Instruments that ease the task of interfacing the CoCo to the real world. The Extender Board eliminates the problem of getting signal lines out of the CoCo where you can connect to them. The PIA Board gives you a fully functional Peripheral Interface

The Coco Graphics Designer Plus $29.95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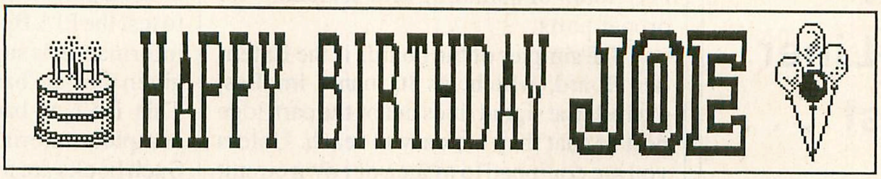
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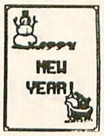
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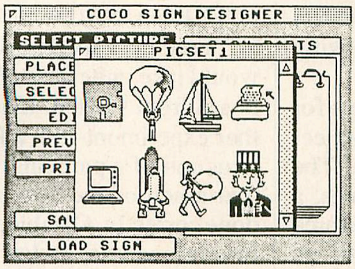
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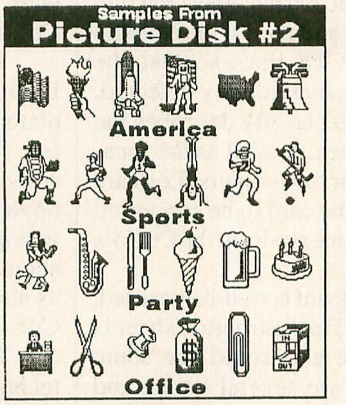
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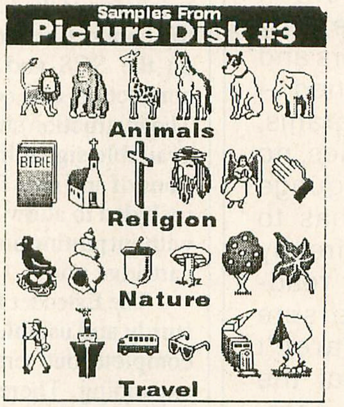
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BIBLE
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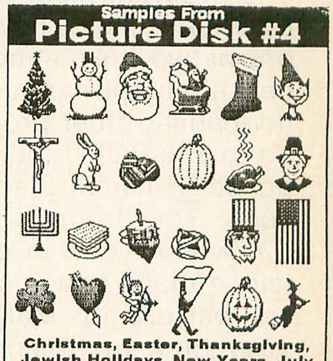
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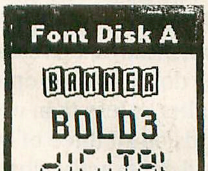
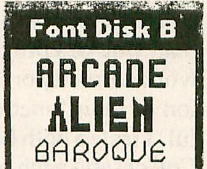

Font Disk A
BANNER
BOLD3
DIGITAL
SHADOW
STENCIL
STRIPES
TYPE
VARIETY
WESTERN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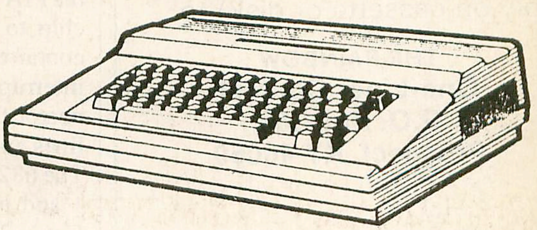

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About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette or disk) to:

THE RAINBOW
One-Liner Contest
P.O. Box 385
Prospect, KY 40059

Adapter (PIA) chip on a printed circuit card ready for your experiments and circuit designs. Either board will save countless hours of soldering and searching for proper parts.

The simpler of the boards is the Extender Board, which, as its name implies, extends the signal lines out of the cartridge port so that they are easy to reach. Unless you are equipped to make your own circuit boards at home, making a cartridge port extender requires an awful lot of soldering or some delicate crimping of connectors. Fraser Instruments' Extender Board lets you start on your circuit rather than having to build the extender first.

The board contains three sockets for project boards and a single in-line connector for connection to a logic probe. The logic connector supplies all data lines, a ground line and the E-clock line. The three main connectors supply all of the cartridge port lines. The end connector is a simple extension of the CoCo's bus lines; the two top connectors are supplied with jumpers on the SCS and CTS lines so that the connectors can be individually selected. The instruction sheet briefly describes the available signal lines, as well as the locations of and uses for the jumpers. Legs are included to allow the card to be supported without putting undue strain on the CoCo's cartridge port.

The Extender Board is well-constructed, sturdy and useful. The instruction sheet is complete but terse and could use some expanding. There are several books and many articles available (but not from Fraser) describing the signal available at the cartridge port, so the shortage of information on the instruction sheet is not a real handicap.

The more interesting of the boards is the PIA Board, which connects a 6821 PIA chip to the CoCo. In addition, the card contains a jumper for the non-maskable interrupt line and a breadboard-type connector for all of the PIA input and output lines and a few of the cartridge port lines. The 6821 is the same PIA used in the CoCo 1 and is similar to the 6822 used in the CoCo 2 and 3. It is also the backbone of many interfacing projects described in hardware articles and books. The PIA Board can save you a great deal of time when you are designing and testing a project based on the 6821.

The instructions that come with the PIA Board are barely enough to help you get started using the 6821 PIA. If you already have a project in mind, you probably won't need to read them more than once. If, however, you want to use the PIA Board to learn about interfacing techniques, you must get some additional information.

Fraser Instruments supplies two photocopied data sheets from Motorola describing the 6821 PIA and also a short BASIC program listing that will allow you to test the PIA Board. Very little additional information is supplied. Basically, you are given the bare basics and left on your own. This isn't as bad as it seems at first; a complete tutorial would require a book. Such books are available, as are numerous articles dealing with CoCo interfacing using a 6821. Perhaps your best sources of information are hardware articles in back issues of THE RAINBOW.

I see the PIA Board as a timesaver. It would take quite a bit of time to build this board from scratch. Using it, you can either experiment with a PIA or begin construction of a particular project, knowing that much of the boring work is already done correctly. Combined with some good tutorial material and/or circuit diagrams, the PIA Board will allow nearly anyone to learn how to use a 6821 PIA to connect a CoCo to the outside world.

Both the PIA Board and Extender Board are well-constructed and have gold-plated connectors for a long and trouble-free life. Both have the potential to save active experimenters time and to help novices enter the world of computer interfacing in a painless way. Both boards should, of course, be used with caution — as should any device that connects to the CoCo's cartridge port.

The PIA Board could use additional technical information and perhaps some suggestions for books and articles dealing with the 6821. Fraser Instruments also produces PIA boards using other PIAs, including the 6822, 6522 and 8522 chips. These may also be of interest to some CoCo users.

I haven't mentioned how well either board functions, and there is a reason for that. Unlike a program, these boards either work correctly or they don't, and my opinion of their functionality is less than useful. I tested both boards on all three of my CoCos, and each board did exactly what it was designed to do. There is really nothing more to say about them other than that they perform as advertised. If you've been postponing your interfacing creativity because of the work required, now is the time to stop postponing and start working. Fraser Instruments has what you need to get started without the usual hassle.

(Fraser Instrument Co., P.O. Box 712, Meridian, ID 83642, 208-888-5728; $45 each plus $3.50 S/H: First product review for this company appearing in THE RAINBOW.)

—Donald L. McGarry

The Rainbow Bookshelf

Fill out your CoCo library with these selections

The Complete Rainbow Guide to OS-9

Authors Dale Puckett and Peter Dibble show how to take advantage of OS-9's multitasking and multiuser features. An easy-to-read, step-by-step guide packed with hints, tips, tutorials and free software in the form of program listings.
Book $19.95, Disk Package $31 (2 disks, book not included)

The Complete Rainbow Guide to OS-9 Level II Vol. I: A Beginners Guide to Windows

Puckett and Dibble have done it again! They uncover the mysteries of the new windowing environment and demonstrate clever new applications. More hints, tips and plenty of program listings. Book $19.95, Disk $19.95

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Please note: The tapes and disks offered by The Rainbow Bookshelf are not stand-alone products. That is, they are intended to be an adjunct and complement to the books. Even if you buy the tape or disk, you will still need the appropriate book. OS-9® is a registered trademark of the Microware Systems Corporation.

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

The Aussie Collection, a set of six public domain disks from Australia. Disk 1 is full of music programs, both in BASIC and in multipart machine language. Disk 2 contains math/graphing programs, and Disk 3 has "minipics" for DMP printers. Disk 4 is mostly games while Disk 5 is a mix of utilities and games. Disk 6 is a geography lesson on Australia. For the CoCo 1, 2 and 3. *The Public Domain Software Copying Company, 33 Gold St., Suite L3, New York, NY 10038, (800) 221-7372; $39.95 for the set, or $10 each, $4.50 S/H.*

Chess Nuts, a two-player chess game "designed with both the amateur and the serious player in mind." Requires a CoCo 3 and a disk drive. *Mousesoft Software, P.O. Box 18058, Milwaukee, WI 53218, (414) 466-3617; $20.*

DaVinci3, a graphics program for the CoCo 3 that supports a joystick, mouse or X-pad. Features include Draw, Erase, Selective Erase (one color), Box, Circle/Ellipse, Spray Can, Zoom, Line, Text & Fonts and Cut/Paste commands. Also, there is the capability to save and load pictures and palettes, print to Tandy printers (including the CGP-220), maintain "dynamic, instant control of all 16 colors," convert PMODE 3/PMODE 4 pictures to the Hi-Res 16-color format, and to capture and edit Hi-Res pictures from other programs and games. Requires 128K Color Computer 3, one disk drive, input device, and TV or color monitor (color recommended; composite and RGB supported). *Owl-Ware, P.O. Box 116-A, Mertztown, PA 19539, (800) 245-6228; $37.95.*

◆ **DIASM**, a disassembler with six options: Clear Buffer, Directory, Disassemble File Onscreen, Disassemble File to Printer, Disassemble Range to Printer and Disassemble Memory Onscreen. You can view memory in its ASCII representation and toggle between decimal and hexadecimal. For the CoCo 1, 2 and 3. *GSW Software, 8345 Glenwood, Overland Park, KS 66212; $20.*

◆ **Digitizer 3**, a joystick-/menu-driven CoCo 3 program for digitizing and playing back sound. It comes with several sample sounds, including a guitar riff, allows you to digitize your own samples "using any source that can be connected to the black wire of the cassette cable," and includes a preview feature that lets you to hear what a sample will sound like digitized, without having to digitize the sound. *DSD Software, 12 Undercliff Drive, Scarborough, Ont. M1M 1A5, (416) 267-8920; $12.99 US, $15 CDN.*

Dino Data Base, a menu-driven educational database listing 200-plus dinosaurs in the two main classifications, Ornithischian and Saurischian. The program will draw the dinosaur, list the derivation of its name (e.g., Tyrannosaurus means "tyrant lizard"), and on a flat map of the world indicate where the dinosaur lived. It comes on disk for the CoCo 3. *RAM Electronics, 814 Josephine, Monmouth, OR 97361, (503) 838-4144; $29.95.*

◆ **Floppy Filer**, a diskette organization program for keeping track of files stored on floppy disks. It creates an alphabetized cross-reference between filename and disk identifier. The cross-reference is then printed in a three-column form suitable for notebook use. *Floppy Filer* can handle a maximum of 1,150 files. For the CoCo 1, 2 and 3 disk drive system. *Gregory Software, Box 573, Kirkland, IL 60146, (815) 522-3593; $8.*

FontGen, a program that lets users design custom fonts, borders and icons for their CoCo 3s. A font may have characters that are two or three times the size of standard characters. Also, fonts can be saved to disk and loaded upon demand. A machine language subroutine included allows users to have up to four different fonts resident in memory at all times. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $24.95.*

◆ **GAT Backup**, a disk utility that will do backups of an entire disk or of a section, for a user-specified number of copies. It will also format disks and call up disk directories within itself. *GSW Software, 8345 Glenwood, Overland Park, KS 66212; $15.*

I Ching, the ancient Chinese Book of Changes put on disk and tape for the CoCo; I Ching was the Chinese way of trying to discover "the underlying patterns that could explain how the events in our lives come about as they do." Requires a 32K CoCo 1, 2 or 3 and either a tape or disk system. *Tothian Software, Inc., Box 663, Rimersburg, PA 16248; $24.95.*

J.A.C., a Joystick Alternative Controller that allows "arcade-type action control using your Atari-type joystick." Includes a rapid-fire option. A nine-pin Atari/Commodore joystick plugs into the controller, which plugs into a CoCo joystick port. *4-TECHS, P.O. Box 2575, Merrifield, VA 22116; $18.50 plus $2.50 S/H.*

The KJV on Disk No. 34, The Book of John, the Book of John from the King James version of the Bible, in ASCII files. The files can be called up within a word processor for viewing. Requires a disk drive and a CoCo 1, 2 or 3 with 32K, and a word processor that leaves at least 24K of free memory for documents. An info sheet is available for $1. *BDS Software, P.O. Box 485, Glenview, IL 60025, (312) 998-1656; $3.*

Leonardo's Paintbox, an expanded version of *Leonardo's Pencil* allowing you to translate drawings made with *Paintbox* to BASIC programs that will reproduce the pictures when run. These programs can be saved to disk and merged as routines into other programs. Requires a CoCo 3 with a disk drive. A two-button, self-centering joystick is recommended. On disk for the CoCo 3. *E.Z. Friendly, 118 Corlies Ave., Poughkeepsie, NY 12601, (914) 485-8150; $29.95 plus $1.50 S/H.*

Memory, a "Concentration"-type game in which you try to match up pairs of objects, turning over tiles all over the board. The grid contains 18 pairs of objects, which are different for each game. The joystick is used to point to a tile, and the firebutton is pressed to flip it. The program comes on disk for the CoCo 3. *RAM Electronics, 814 Josephine, Monmouth, OR 97361, (503) 838-4144; $29.95.*

Picture Puzzles, a program based on the "tile" puzzles (in which one tile is missing from a grid, and you solve the puzzle by sliding the tiles and arranging them in the proper order). On disk for the CoCo 3. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $19.95.*

Printer Drivers for Home Publisher, a package of additional printer drivers for the CoCo 3 *Home Publisher* desktop publishing program. The drivers support the following seven printers: Tandy CGP-220, Tandy DMP-110, C. Itoh 8510 AP, Epson MX-80, Okidata 20, Panasonic KX-P1090 and the Star SG-10. The appropriate driver must be copied to the CMDS directory of Side B of the *Home Publisher* disk. Requires a CoCo 3, a disk drive, a printer, and a copy of *Home Publisher*. *Tandy Corporation; $19.95: Available in Radio Shack stores nationwide, Cat. No. 90-0911; also available by calling Express Order at (800) 321-3133.*

QuantumLeap**, a "dice" game for the CoCo 3 that has players rolling six ivories for four-of-a-kinds, five-of-a-kinds, "triple doubles," small and large straights, and the Quantum**Leap — six dice of the same number, worth 250 points.

Requires CoCo 3 and a disk drive. Joystick supported. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $19.95.*

◆ **Revenge of the Germs**, a graphics Adventure game that "requires clear, logical thinking and a little creativity to solve." When the game begins, you find yourself in a hospital bed, and the only thing you can see besides your two feet is a broken door. For the CoCo 1, 2 and 3 and a disk drive. [Note: "25 percent of all profits from Revenge of the Germs will be donated to the Nature Conservancy, a non-profit organization dedicated toward the preservation of natural land."] *The Software System, 5576 Oak Vista Drive, Cincinnati, OH 45227; $9.95.*

Roots, a program designed for "engineers, engineering students and those studying mathematics" that locates roots of equations. A short tutorial is enclosed. Available on cassette only for the CoCo 1, 2 and 3. *Lee Sullivan, P.O. Box 8718, Penacook, NH 03303, (603) 753-4497; $4 for printout of listing, $8 for program on cassette.*

Rupert Rhythm, an arcade game in which Rupert Rhythm, songwriter extraordinaire, has had his music stolen by Hardrock Harry, manager of Music Box Records. Unless Rupert can get his manuscripts back, Harry will release all the songs under his name. Rupert must infiltrate Music Box Records and collect all his stolen notes, which are scattered throughout 17 rooms. The game features 16-color graphics screens, animation and "some of the hottest digitized percussion music you've ever heard on your Tandy Color Computer 3." Requires a CoCo 3 and a disk drive. *Game Point Software, P.O. Box 6907, Burbank, CA 91510, (818) 566-3571; $24.95.*

Silpheed, an arcade-type game that outfits you with a "super space age dogfighter" rigged for combat in an intergalactic war. You can infiltrate a multitude of fortresses and encounter increasingly vicious enemies in 15 levels against more than 20 varieties of computerized opponents. Comes on a ROM pack for the CoCo 2 or 3. *Sierra On-Line, dist. by Tandy; $29.95: Available in Radio Shack stores nationwide.*

◆ **Start OS-9**, "an enjoyable hands-on guide to OS-9 Level II on the Color Computer 3" that features 10 tutorials (disk included) and 14 chapters covering boot creation, multitasking, RAM disks, process priority, command interpretations, formatting disks, the SYS directory, file handling, loading and unlinking commands, windows, etc. The book also features seven appendices, which are written by such CoCo luminaries as Marty Goodman, William Brady, Kevin Darling, Dale Puckett, Stephen Goldberg and Paul Ward. Requires a 512K CoCo 3, two disk drives and an RGB or monochrome monitor capable of displaying 80 columns of text. An 80-column printer is recommended, along with 40- or 80-track double-sided drives, RAM disks or hard disks, and a cooling fan, "because some CoCo 3s run hot." *Kenneth-Leigh Enterprises, 1840 Biltmore St. NW, Suite 10, Washington, DC 20009, (202) 232-4246; $32.95 plus $2.50 S/H.*

◆ **Tailyn Communications 2400 Baud Modem**, an external Hayes-compatible 2400-baud modem with RS-232 interface, synchronous/asynchronous operation, eight LED status indicators, auto-redial, and storage for 10 telephone numbers. An internal version is available ($144), as are 1200-baud models ($89 for external and $79 for internal). *Tailyn Communications Co., Inc., 6100 Southwest State Road 200, Suite 6118, Ocala, FL 32674, (800) 282-4596; $159.*

◆ **TelePak/TelePak+**, two versions of an RS-232 interface designed as a direct replacement for the Tandy Deluxe RS-232 Pak. The TelePak requires the Tandy Multi-Pak Interface or gray Color Computer 1, taking advantage of the built-in 12-volt power supplies. TelePak+ can be used with any Color Computer, Multi-Pak or Y cable. A standard DB25 cable is required. The TelePak uses data transmission rates of from 50 to 19,200 baud, and is compatible with Disk BASIC and OS-9 software using the standard address scheme for RS-232 communication. *Orion Technologies, P.O. Box 63196, Wichita, KS 67203, (316) 946-0440; $44.95 for TelePak, $49.95 for TelePak+.*

Try-O-Menu, a program that allows single-key loading and execution of BASIC and binary programs (protected programs accepted) from disk. When run, the program lists seven items from the directory; pressing the N key reveals seven more, etc. On disk for the CoCo 1, 2 and 3; a CoCo 3 mode is included. *Try-O-Byte, 1008 Alton Circle, Florence, SC 29501, (803) 662-9500; $19.99 plus $3 S/H.*

Try-O-Tax, 6th Ed., a user-prompting program to assist the individual with federal income taxes. "The extensive changes for 1988 have been included and the program reworked completely for improved interaction with the user." It calculates and prints schedules A, B, C, D, E, F and SE, as well as forms 1040, 1040A (with Schedule 1), 2106, 2441 and 6252. Color Disk BASIC is required. Upgrades from the 1987 version are available for $30 plus $3 S/H. *Try-O-Byte, 1008 Alton Circle, Florence, SC 29501, (803) 662-9500; $44.99 plus $3 S/H.*

◆ **Vehicle Cost Printout**, a BASIC printer program designed to track all vehicle expenses over a multi-year time period. Printouts are available for any time period within a one-year span, showing monthly fuel purchased, fuel used, miles driven and repairs made. The program calculates expense data, determining total vehicle cost per mile. Available on tape or disk for the CoCo 1, 2 and 3. Requires Extended BASIC and a printer capable of condensed and elongated type. *Alan Hanusiak, 37 Grand Ave., Rockville, CT 06066, (203) 875-2027; $18.*

VIP Writer III, Version 2, a new version of the CoCo 3 word processor that adds support for 512K memory, four-color pop-up windows, a backspace key, and a new configuration program. The DS command now saves the entire text buffer, regardless of cursor position; the PS (Partial Save) command replaces the old DS command. *VIP Writer III* owners can upgrade for $10 plus $3 S/H. *VIP Writer* owners can upgrade for $49.95 plus $3 S/H. Those upgrading must send their original disk. *SD Enterprises, P.O. Box 1233, Gresham, OR 97030, (503) 663-2865; $79.95.*

Warp One, a menu-driven telecommunications program for OS-9 Level II. Features include Auto-Dial, Auto-Macro, Auto-Buffer, ASCII file output, Xmodem file transfer and directory functions. Requires a 512K CoCo 3, at least one disk drive, OS-9 Level II, an RS-232 pack and a modem. *Alpha Software Technologies, P.O. Box 16522, Hattiesburg, MS 39402, (601) 266-2773; $34.95.*

Yahtzzz, a "dice" game in which each player rolls five dice three times per turn in order to come up with four-of-a-kinds, three-of-a-kinds, full houses, small straights, etc. Requires 32K CoCo and one disk drive; a joystick is supported. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $14.95.*

◆ **First product received from this company**

The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* – that we have examined it and have a sample copy – but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

–Lauren Willoughby

KISSable OS-9

BASIC09: A Great Language

By By Dale L. Puckett
Rainbow Contributing Editor

Most of us take a moment to reflect on the meaning of life or some equally esoteric subject in those seconds between the time we take down last year's calendar and put up the new, unblemished model. I owe you that moment here, too, and so I would like to share a few thoughts about where I have been and where I am trying to go with this column.

We have had an exciting year. OS-9 Level II moved to the front of the stage early in '88, and *Multi-Vue* was finally released to an eager crowd. By the middle of the year, some notable hackers in our community were giving some interesting demos.

My goal throughout the year was to show you how to harness OS-9 Level II's power for your own computer. I started with the *KISSDraw* series because I had always wondered how those magic drawing programs worked. After entering a few lines of code, I was hooked. I wanted to show you that each of us can break down a complicated process — like using a mouse to draw on the screen — into small enough parts to understand the process and solve the problem.

I have tried to give you the big picture by explaining the philosophy behind a process and tried to comment my source listings enough that you could read the theory of operation in the program listing. I hope it has worked and you have been able to put some of the information to work on your own problems.

We've got a long way to go — there are too many things to do with the Color Computer 3 (and its fantastic windowing environment) and not enough hours to do them. However, I hope to introduce you to more exciting concepts during the next year. Since I am fascinated by the *Multi-Vue* environment and the powerful `Windint` manager built into OS-9 Level II, I hope to continue the *DoMenu* series with more code you will find exciting and useful.

I hope you will use the examples as a jumping-off place for your own applications. That's what computing is all about. If you have a particular interest you would like for me to pursue, please let me know. It will make writing this column easier. In the meantime, tradition dictates that January be dedicated to the beginner. I hope I can encourage you to start the new year by working with a new language that's easy to understand and fun to use. Enjoy.

Starting BASIC09

When *Start OS-9* author, Paul Ward, called recently, he presented an opportunity I couldn't refuse. The call reminded me that the annual RAINBOW beginners' issue would be a great time to introduce you to one of the best-kept secrets in the microcomputer world today — BASIC09. For the beginner, Microware's BASIC09 has to be the best language going. I hope the words that follow will inspire you to jump into BASIC09 and help remove the fear of the unknown.

The inspiration for this short piece was created nine years ago (an eternity in the computing arena). If you survey the magazines that serve the competitive personal computing world today, you'll find more than one rave review of *True BASIC* or *ZBASIC*, as packaged for the IBM and Macintosh computers. Writers are heralding these new BASIC programs and proclaiming the birth of a new generation of programming tools. Yet, the features being strutted before an unsuspecting audience are nothing new to seasoned OS-9 enthusiasts. They found these features in a revolutionary language from Microware Systems Corporation in 1979 and have been taking advantage of them ever since. After you read this, I hope you will be inspired enough to start BASIC09. Then you, too, can take advantage of this language's state-of-the-art features. After all, the price is right. Tandy includes BASIC09 in every OS-9 Level II package it sells.

I often hear people with Color Computers say that they don't use BASIC09 because it's too difficult to learn, but these people have never tried it. To these

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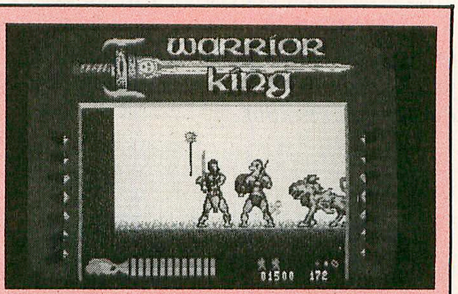
Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP: on packet-radio, K0HYD @ N4QQ; on GEnie, D.PUCKETT2; and on CIS, 71446,736.

SUNDOG SYSTEMS

Warrior King



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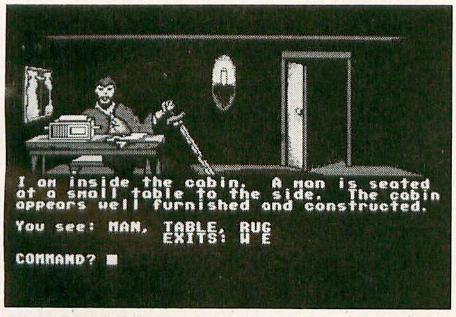

```
I am inside the cabin.  A man is seated
at a small table to the side.  The cabin
appears well furnished and constructed.
You see: MAN,  TABLE, RUG
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COMMAND? ■
```

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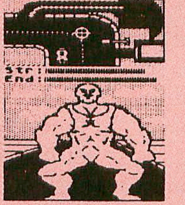

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people, I say that BASIC09 is not difficult. Rather, it's different. After you run your first BASIC09 program (and look back at your first modern BASIC code), I think you'll agree that BASIC09 is easier to understand and use than the Microsoft BASIC interpreter built into the Color Computer 3.

If you are looking for a plain language introduction to BASIC09, I hope you'll pick up a copy of the book, *The Official BASIC09 Tour Guide*, at your local Radio Shack store. In it, you'll find a friendly, plain-language introduction to this fantastic language, and many examples. I also invite you to check out the many contemporary CoCo 3 BASIC09 programming examples published in this column every month.

BASIC09 Advantages

You'll discover BASIC09's many advantages when you write your first program. But since I don't want to keep you in suspense, I'll give you a sneak preview.

First and foremost, BASIC09 is not the same old line-number encumbered BASIC you learned in school. Rather, it is a modern programming language that closely resembles Pascal. In fact, you'll find that translating most Pascal programs to BASIC09 is a rather easy chore. However, while BASIC09 delivers Pascal's outstanding structural qualities, it is less rigid.

Since BASIC09 lets you create well-structured programs without line numbers, your programs will be easier to understand. You won't get lost following 15 `GoTo` statements to meaningless line number locations during your debugging sessions.

> ***"There are too many things to do with the Color Computer 3 (and its fantastic windowing environment) and not enough hours to do them."***

You will also find BASIC09 programs very readable. While this may not seem important to you now, it will be six months from now, when you need to change your program to incorporate new data. Additionally, while you're writing — or running — these programs, you'll still have all the power of OS-9 Level II at your fingertips. For example, if you forget the name of a file stored earlier, you need only type `$ dir` and then press ENTER to receive a listing of all the files in your current data directory. You can do this from BASIC09's command and debug modes, and `Dir` isn't the only command you can summon in this manner — you can run every OS-9 command in your current execution directory.

You can also press CLEAR on your keyboard to be taken to another window, where you'll find an OS-9 prompt waiting for you. The prompt will be there because you started an immortal `Shell` in that window earlier.

I can almost hear you object that a programming language this easy to use can't be very powerful, but this is not true. An example of BASIC09's power can be seen in Bill Brady's *Wiz Professional.* This communications environment competes admirably with Macintosh's *Red Ryder* communications program. And while the CoCo 3 costs $159, the Macintosh Plus costs 10 times as much. *Wiz Professional* also competes well with *ProComm* on an IBM PC, and it is written in BASIC09.

You can also look at *KISSDrawPut.* I think this short experiment from a tutorial series in this column has much of the functionality and a much nicer user interface than the commercial drawing program sold by Tandy. It runs just as fast too. More importantly, it was written in BASIC09 in the course of three or four weekends.

Look closely at a few of the commercial OS-9 Level II software packages you've purchased. You may notice that several of them are stored in BASIC09 I-Code modules. This means they were generated with BASIC09. You have access to the same programming language as the commercial programmer, and you received it free with your OS-9 Level II system software.

BASIC09 Proof

I'm running out of room for this commercial, and I haven't even mentioned BASIC09's data typing capability. You can learn more about this subject in *The Official BASIC09 Tour Guide.* And since I wouldn't want to tease you too much, I'll throw in a short example here.

But first, let me come up with a few lines of code that reinforce what I've said about this programming language. Let's start with BASIC09's readability. (Remember, you may need to understand your stroke of genius many months after the light bulb pops on.)

```
PROCEDURE OurWay
(* Show how Basic09 control structures can make
(* your programs easy to read and understand. This
(* program will produce the same results on your
(* Color Computer screen as the program above.
DIM number:INTEGER
INPUT "Type a number:" ,number
PRINT
IF number > 0 THEN
    PRINT "Your number is positive."
ELSE
  IF number < 0 THEN
    PRINT "Your number is negative."
  ELSE
    PRINT "Your number is zero."
ENDIF
ENDIF
PRINT
END
```

Figure 1

Compare this BASIC listing with the BASIC09 listing shown in Figure 1:

```
10 REM THIS IS THE OLD WAY
100 INPUT "PLEASE TYPE A NUMBER:"
, X
110 IF X > 0 THEN 150
120 IF X < 0 THEN 170
130 PRINT "THE NUMBER IS ZERO."
140 GOTO 180
150 PRINT "THE NUMBER IS POSI-
TIVE."
160 GOTO 180
170 PRINT "THE NUMBER IS NEGA-
TIVE."
180 END
```

I'll bet you love BASIC09 already. However, if you can still say that the BASIC listing is easier to understand after reading both, perhaps BASIC09 isn't for you.

If I may be allowed another commercial break, I typed the BASIC09 listing with all lowercase letters. Later, when I listed it, BASIC09 automatically typed its keywords in all *uppercase* letters. It also automatically indented its control structures. All this is a bonus you get every time you write a program with BASIC09.

I mentioned BASIC09's powerful data typing ability. Now, let's see if we can come up with a simple example that shows why this feature is something to rave about. BASIC09 knows about five data types — `BYTE`, `INTEGER`, `REAL`, `STRING` and `BOOLEAN`. I know, almost every BASIC interpreter today knows at least three of these data types. However, BASIC09 revolves around another keyword: `TYPE`.

In review, a `BYTE` is a data type that can be stored in a single memory cell in your computer, exactly eight bits (one byte) wide. Likewise, an `INTEGER` variable is stored in a memory cell 16 bits (two bytes) wide, floating-point numbers are stored in a series of memory cells designed to hold them (five bytes in BASIC09), and English language characters and words that you can read on the screen are stored in `STRING` variables. In BASIC09, strings can be any length — if you have enough memory. You assign the amount of memory each `STRING` variable will use with a `DIM` statement. Finally, a `BOOLEAN` variable is stored in a single byte that can have only one of two values. A `BOOLEAN` variable must be either *true* or *false*.

If you could work with data in just one of these five shapes, your universe would have a narrow scope, and you would find it difficult to get anything done. No wonder many people hate BASIC. However, you have BASIC09 with its unique `TYPE` statement on your side. Let's look at an example of a few homemade BASIC09 data types. Imagine that you are the secretary of a local Lions' Club and you must set up a mailing list you can use to print mailing labels and maintain information about everyone in the club.

First, you must tell BASIC09 the kind of information you want to print on your mailing labels. Of course, the best — and one of the easiest — ways to do this is to use a BASIC09 `TYPE` statement. Something like the program shown in Figure 2 should work.

```
PROCEDURE LionsLabels
(* Show how to use a Basic09 TYPE statement
TYPE label=firstname:STRING[14] ;middleinitial:STRING[1];
lastname:STRING[20];street,city:STRING[24]; state:STRING[2];zip:REAL
```

Figure 2

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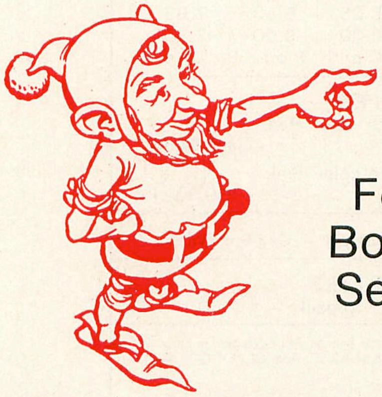

For Naughty
Boys and Girls
See Page 101.

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In that `TYPE` definition, we told BASIC09 to reserve 14 bytes to hold a member's first name, one character for a middle name, and 20 characters for a last name. Then we set aside 24 bytes for the first two lines of our member's address, two characters for the state and five bytes for a *real* number to store the ZIP code. In this particular example, we have reserved 90 bytes of memory for each member of the club. However, with BASIC09's `TYPE` statement, you can have your labels your way.

Once we defined our new data type, we must set aside the memory needed to use it inside our Color Computer. Do this with the `DIM` statement. For example, if we have between 90 and 100 members in our Lions' Club, we will probably want to reserve enough memory to hold the names and and addresses of at least 100 members.The following should do the trick:

```
DIM LionList(100):label
```

Here we have set aside 9,000 bytes of memory to hold the information needed to print up to 100 mailing labels. To store our names and addresses in the array of 100 mailing labels, we can use a number of techniques. In all cases, we start with the knowledge that the name of our array is `LionList`. We also know that each element (or member) in our array has a number of fields. We defined these fields in our `TYPE` statement. This means that the first mailing label in our list can be initialized with the following information:

```
LionList(1).firstname:=Dale
LionList(1).middleinitial:=L
LionList(1).lastname:=Puckett
LionList(1).street:=805 West
Edmonston Drive
LionList(1).city:=Rockville
LionList(1).state:=MD
LionList(1).zip:=20852
```

Your array can be initialized with assignment statements like those described, or you can use a standard loop structure to write information about all of your club members to the list at the same time. The loop can get the information from your keyboard or another disk file.

Once you have entered your data, you'll be in mailing-label heaven. You'll also be able to take advantage of BASIC09's `GET` and `PUT` statements. (Extended Color BASIC, eat your heart out.) To print the first mailing label in your array to the screen, simply use the following line:

```
PUT #1, LionList(1)
```

If you've entered all the names and you want to print a hard copy of your entire mailing list, all you need is this code:

```
DIM printer:BYTE
OPEN #printer,"/p"
PUT #printer, LionList
CLOSE #printer
```

While developing my *KISSDraw* tutorial series, I used a similar technique with BASIC09 `TYPE` and `PUT` statements in a drawing program. I called it *KISSDrawPut*. I was able to increase the speed of the program and have a place to store the pictures, so I could save

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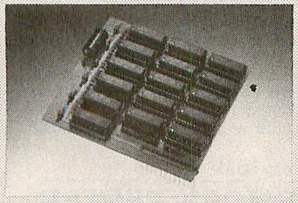

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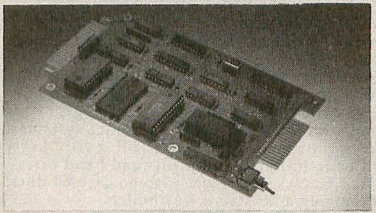

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TEXTPRO IV is the most advanced word processing system available for the COCO-3, designed for speed, flexability and extensive document processing. It is not like most of the other word processing programs available for the Color Computer. If you are looking for a simple word processor to write letters or other short documents, and never expect to use multiple fonts or proportional spacing, then most likely you'll be better off with one of the other simpler word processors. But, if you want a powerful word processor with extensive document formatting features to handle large documents, term papers, manuals, complex formatting problems and letter writing, then TEXTPRO IV is what your looking for. It works in a totally different way than most word processing programs. It uses simple 2 character abbreviations of words or phrases for commands and formatting information that you imbed directly in your text. There are over 70 different formatting commands you can use without ever leaving the text your working on. There are no time comsuming, and often frustrating menu chases, you are in total control at all times. You can see what the formatted document will look like before a single word is ever printed on your printer. Including margins, headers, footers, page numbers, page breaks, column formatting, justification, and Bold, Italic, Underline, Double Width, Superscript and Subscript characters right on the screen.

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- 54 Different Character Sizes available from 14 to 212 cpl.
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- Double Width, Double Height and Quad width characters.
- Scroll Protect form 1 to 23 lines on the screen.
- Mixed Text & Graphics in HSCREEN 3 mode.
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- Programmable Automatic Key repeat for fast editing.
- Full Control Code Keyboard supported.
- Selectable Character & Background color.
- Uses only 4K of Extended (2nd 64K) or Basic RAM.
- Written in Ultra Fast Machine Language.

HI-RES III will improve the standard display capabilities of the Color Computer 3, even the 40 and 80 column displays have several features missing. For example, you can't use PRINT @ or have different character sizes on the same screen, even when mixing text and graphics with the HPRINT command. Hi-RES III can give you the kind of display you always dreamed about having on your CoCo-3, with a wide variety of display options that you can easily use with your Basic or ML programs.

HI-RES III is totally compatible with Enhanced Color Basic and its operation is invisible to Basic. It simply replaces the normal screen display with an extremely versatile display package. With the full control code keyboard, you can control many of HI-RES III extended functions with just a couple of simple keystrokes.

Requires 128K Tape or Disk $34.95

512K RAMDISK & MEMORY TESTER

RAMDISK is an ALL Machine Language program that will give you 2 ULTRA High Speed Ram Disks in you CoCo-3. It does not need or require the OS-9 operating system. It works with R.S. DOS V1.0 or V1.1 and it is completely compatible with Enhanced Color Disk Basic! Plus it allows your CoCo-3 to run at double speed all the time even for floppy disk access!!! It will not disappear when you press reset like some other ramdisk programs. The MEMORY tester is a fast ML program to test the 512K ram. It performs several bit tests as well as an address test so you know that your 512K of memory is working perfectly.

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- Disassemble programs Directly from disk, unlike other disassemblers.
- Automatically locates Begin, End and Execution address.
- Output Disassembled listing with labels to the Printer, Screen or both.
- Generates Assembler source files directly to disk or printer.
- Built in Hex/Ascii dump/display to locate FCB, FCC & FDB areas.
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- Selectable Foreground & Background colors & Printer Baud rates.
- Built in Disk Directory an Kill file commands.
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- Written in Ultra Fast Machine Language.

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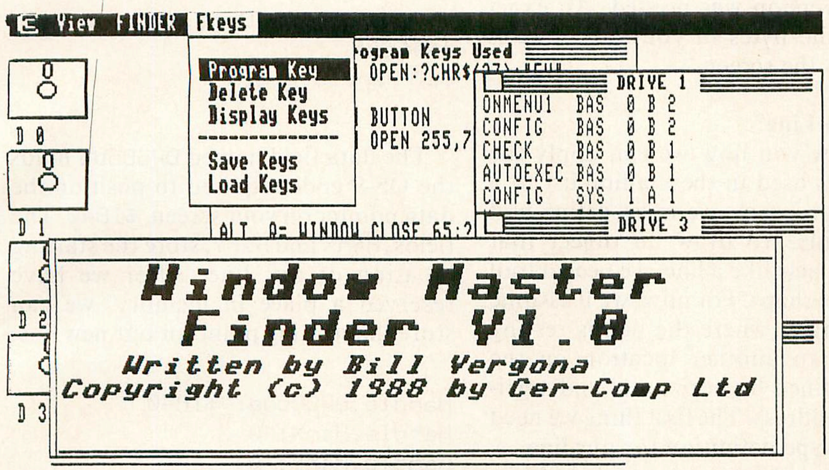
"Window Master"



```
ogram Keys Used
 OPEN:?CHR$(27);
 BUTTON
 OPEN 255,7
ALT  0= WINDOW CLOSE 65:2
```

```
ONMENU1  BAS  0 B 2
CONFIG   BAS  0 B 2
CHECK    BAS  0 B 1
AUTOEXEC BAS  0 B 1
CONFIG   SYS  1 A 1
```

Window Master
Finder V1.0
Written by Bill Vergona
Copyright (c) 1988 by Cer-Comp Ltd

Screen Display Fonts

Window Master supports up to 54 different character sizes on the screen with 5 different character styles. You can have Bold, Italic, Underlined, Super-Script, Sub-script or Plain character styles or any combination of them in any character size. You can also change the text color and background at any time to get really colorful displays.

Fully Basic Compatible

Window Master is fully compatible with Enhanced Color Disk basic with over 50 Commands & functions added to fully support the Point & Click Window System. Window Master does not take any memory away from Basic, so you still have all the Basic Program memory available.

Hi-Resolution Displays

Window Master uses the full potential of the Color Computer 3 display by using the 225 vertical resolution display modes instead of the 192 or 200 resolution modes like most other programs. It uses either the 320/16 color mode or the 640/4 color display to give you the best display resolution possible, and can be switched to either mode at any time.

Mixed Text & Graphics

Window Master fully supports both Text & Graphics displays and even has a Graphics Pen that can be used with HLINE, HCIRCLE, HSET and more. You can change the Pen width & depth and turn it on or off with simple commands. We also added Enhanced Graphics Attributes that allow graphics statements to use And, Or, Xor and Copy modes to display graphic information. With the Graphics enhancements added by Window Master, you could write a "COCOMAX" type program in Basic! In fact we provide a small graphics demo program written in Basic.

Event Processing

Window Master adds a powerful new programming feature to Basic that enables you to do "Real Time" Programming in Basic. It's called Event Trapping, and it allows a program to detect and respond to certain "events" as they occur. You can trap Dialog activity, Time passage, Menu Selections, Keyboard activity and Mouse Activity with simple On Gosub statements, and when the specified event occurs, program control is automatically routed to the event handling routine, just like a Basic Gosub. After servicing the event, the sub-routine executes a Return statement and the program resumes execution at the statement where the event occured.

Enhanced Editing Features

Window Master adds an enhanced editor to Basic that allows you to see what you edit. It allows you to insert & delete by character or word, move left or right a word or character at a time, move to begin or end of line, toggle automatic insert on/off or just type over to replace characters. The editor can also recall the last line entered or edited with a single key stroke. You can even change the line number in line to copy it to a new location in the program.

Window Master Features

Multiple Windows

Window Master supports multiple window displays with up to a maximum of 31 windows on the screen. Overlapping windows are supported, and any window can be made active or brought to the top of the screen. Windows can be picked up and moved anywhere on the screen with the mouse. There are 6 different Window styles to choose from and the window text, border and background color is selectable.

Pull Down Menus

Menus are completely programmable with up to 16 menus available. They can be added or deleted at any time in a program. Menu items can be enabled, disabled, checked or cleared easily under program control. Menu selection is automatically handled by Window Master & all you have to do is read a function variable to find out which menu was selected.

Buttons, Icons & Edit Fields

Each Window can have up to 128 buttons, Icons or Edit fields active, if you can fit that many. Buttons, Icons and Edit field selection is handled automatically by Window Master when the mouse is clicked on one. All you have to do is read a Dialog function to find out which Button, Icon, or Edit field was selected, its very simple.

Mouse & Keyboard Functions

Window Master automatically handles the Mouse pointer movement, display and button clicks. It will tell you the current screen coordinate, the local window coordinate, window number the mouse is in, the number of times the button was pressed, which window number it was clicked in and more. The Keyboard is completely buffered, and supports up to 80 programmable Function keys that can contain any kind of information or command sequences you can imagine. You can load and save function key sets at any time. So, you can have special sets of function keys for different tasks. The "Ctrl" key is supported so that you have a full control code keyboard available.

Window Master Applications

Window Master pushs the Color Computer 3 far beyond its normal capabilities, into the world of a "User Friendly" operating enviornment. We are already planning several new programs for use with Window Master. So you don't have to worry about having to write all your own programs. And don't forget that many existing Basic and M.L. programs will run under Window Master with little or no changes. The Possibilities for Application programs are endless: Spread Sheets, Word Processing, Communications, Education, Games, Graphic Design, Desk Top Publishing and on and on.

Hardware Requirements

Window Master requires 512K of memory, at least 1 Disk Drive, a Hi-Res Joystick Interface and a Mouse or Joystick.

Technical Assistance

If you run into difficulty trying to use some of Window Master's features, we will be happy to assist you in any way possible. You can write to us at the address below or call us between 10am and 2pm Pacific Standard Time for a more timely response. Sorry, no collect calls will be accepted.

Ordering Information

To order WINDOW MASTER by mail, send check or money order for $69.95, plus $3.00 for shipping & handling to the address below. To order by VISA, MASTERCARD or COD call us at (702)-452-0632
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them to a disk file and reload them later. Much of the increased speed came from the BASIC09 `GET` and `PUT` statements. With the `GET` and `PUT` statements, no data conversion was needed. An exact copy of the bytes in your structure is written to the screen.

What Is a Line?

To show you how we can apply the techniques used in the mailing list to a drawing program, we must define and draw a line. To draw an object that looks and acts like a line, we need a tool — a pen perhaps. For now, we'll assume the line starts where the pen is resting and runs to another location on the screen defined by horizontal and vertical pixel address. The first thing we need is a data-type definition for our line.

Since we will also want to draw bars, boxes and circles, etc., let's keep our definition generic. We will define a data-type-named object in the following manner:

```
TYPE object=DCode,HorP,VerP:
INTEGER
```

Then, we will reserve a place in memory to store it with a `DIM` statement and name our new variable `pen`.

```
DIM pen:object
```

We now have a place to store the `pen` we could use to draw a line. To use it, we must define our line and initialize it in memory. Within OS-9, all drawing primitives are defined by the escape code, `$1B`, followed by an additional byte. To put a line on the screen, send `$1B` followed by `$44`. That means `$1B44`, followed by a coordinate pair, is a line:

```
pen.DCode:=$1B44
pen.HorP:=100
pen.VerP:=50
```

We now have a line stored in Memory Variable `pen` that is waiting to happen. To make it happen, we must `PUT` it on the screen:

```
PUT #1, pen
```

Since we will want to redraw that line later, we need to save a starting location. We will name a new data type `orgin` to complete the mission. We will name our variable `handle`.

```
TYPE orgin=DPSCode,HanX,HanY:
INTEGER
DIM Handle:orgin
```

The data field named `DPSCode` holds the OS-9 code required to position the data pointer on your screen, `$1B40`. The fields, `HanX` and `HanY`, store the starting location of our line. After we have reserved a place in memory, we can store the starting point for our new line:

```
Handle.DPSCode:=$1B40
Handle.HanX:=0
Handle.HanY:=0
```

We can then draw our line with two lines of code:

```
PUT #1, handle
PUT #1, pen
```

Since that is too complicated, we can design a new data type to hold the starting location, the pen and the end point of our line. Since the two lines above will draw a line on the screen, when we run them, `Drawing` seems like a natural name for our new data type:

```
TYPE Drawing=Loc:orgin; tool:
object
```

We will name the field containing the starting point `Loc` (short for location) because that what it contains. Likewise, we will call the field that holds our pen `tool`. Think of it this way: a pen in motion (at least in the right hands) is a tool. After we have defined the objects we will draw, we need a place to store our artwork. We will call our work `Picture` (although it is really an array of drawings). This statement reserves 1,200 bytes of memory for a picture made up of up to 100 individual objects:

```
DIM Picture(100):Drawing
```

Now, here's the magic. To draw your picture, all you need to type is the following:

```
PUT #1, Picture
```

What you've read here only scratches the surface of BASIC09. It is easy to use and fast. I hope you'll join us.

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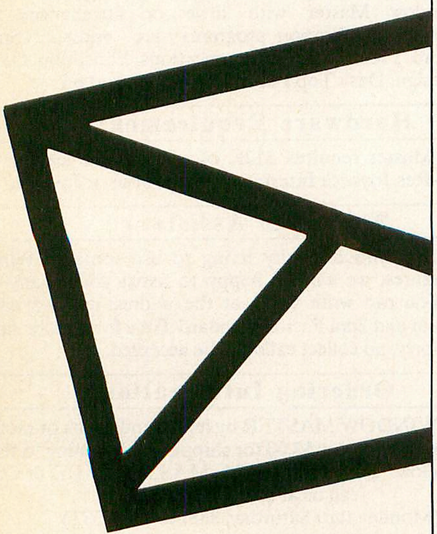

Barden's Buffer

16K ECB

Hamming It Up

By William Barden, Jr.
Rainbow Contributing Editor

Lots of CoCo nuts and computer hobbyists also enjoy a hobby called amateur (or "ham") radio. If you picture a trucker tooling down Interstate 20 with cab-mounted twin antennas flying, you're on the wrong track. Ham radio is *not* that. Ham radio is also not represented by those interference bars on your television, or the mysterious voice that occasionally comes out of your stereo talking about 200 watts into a tri-band beam. And, although my cynical spouse might disagree, ham radio is not characterized by overweight individuals who wear "handie-talkies" on their belts and step on their too-long pants cuffs as they smoke Camel cigarettes and eat pastrami sandwiches.

The New Amateur Radio

In the past, ham radio may have been characterized by some of these things. However, that trucker was operating a CB radio, the stereo interference was probably the fault of the electronics manufacturer, and there are thin, well-dressed yuppie hams. There has been a resurgence of interest in ham radio, and here are some of the fascinating things ham radio lets you do today:

- Packet radio communications allow communication with other hams over hundreds of miles using a computer keyboard and screen.
- Store and forward messages sent around the world by amateur satellites.
- Slow-scan television enables you to send facsimile pictures anywhere in the world.
- Fast-scan local television enables you to transmit standard television pictures, even color, over dozens of miles.
- Bulletin Board Systems nationwide can be accessed just as easily as Delphi and CompuServe, but without charges.
- Autopatch capability allows you to use telephones lines from your car without a cellular telephone.
- Radio teletype communication with other hams, nationwide or worldwide.
- Computer decoding and transmission of Morse code and radio teletype transmissions.
- Reception and display of NOAA and foreign weather service satellite pictures displaying many parts of the earth from space.
- Reception of voice *and* live television from shuttle flights — un-edited by the networks.

In addition to these new activities, there are still the mundane activities that have been around for years — bouncing signals off the moon for communication, using meteor trails for communication with "line-of-sight" equipment, reliable voice communication around the world, contests, rag-chewing and local clubs.

The nice thing about ham radio these days is that computers are becoming integrated into the hobby. Whereas in the old days hardware experts ruled the clubs, today you're likely to find a programmer giving a club presentation on a new packet radio protocol. The CoCo is right in there, being used for a variety of purposes. It's a friendly companion for ham radio because it generates little interference.

The Equipment You'll Need

Since you already have the computer, you're about halfway there with amateur radio hardware. Of course, you don't really need a computer to do basic voice communication with other hams, but I'm assuming that you'll want to be involved in some of the activities that I already mentioned — most

---

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.

of which do require a computer. Here's a thumbnail sketch of what you'll require in addition to your CoCo system:

- A radio transceiver for the high-frequency amateur bands. Known as a "rig," this device is not only a short-wave radio receiver, it also contains a transmitter (hence, *trans*ceiver). Transceivers are high-quality radios that receive Morse code and voice. Typical cost for older equipment is $300 to $1000. Typical cost for new equipment is $500 to $2000. With this rig, you can operate world-wide. Forget the transceiver if your interests are only in local (50-mile radius) communications — see the next item.
- A radio transceiver for very-high and ultra-high frequency amateur bands. This device is similar to the high-frequency rig, but is typically lower power (five to ten watts versus hundreds of watts for the hf rig), smaller (half the size of a small book), and easier to use. Since these devices can be held in your hand, they are known as *handie-talkies* or *hts*. With this rig, you can communicate locally, using voice, packet radio or other modes. Typical cost for new equipment is $200 to $800.
- An antenna. For high-frequency rigs, the antenna must be physically large — typically 70 feet of a single wire strung between your house and a tree, a vertical pole (like a flagpole), or a *beam* (like a large television antenna with fewer elements). Typical costs — $10 to hundreds of dollars. For VHF and UHF handie-talkies, you'll have a built-in whip antenna, although you might want to add a small outside antenna for $20 or so.

That's all you need for the basic amateur station. However, for other activities you may want to get the following:

- A packet radio. This is a device like a computer, but without a keyboard, that sends bursts of text data. It's most often used on the VHF and UHF frequencies. Your computer is used primarily as a "dumb terminal" to receive and transmit the text. It will cost about $200 to $400 new.
- Radio teletype and code equipment. This equipment interfaces to your computer so that you can send and receive radio teletype. You can send and receive Morse code without this equipment, but it's necessary for radio teletype work. Software is included with the equipment. The package costs about $80 to $200.
- Special antennas for satellite communication. If you're interested in this phase of amateur radio, you'll need to have a special purpose antenna. More elaborate systems even track the satellite automatically. The prices range from $20 to $300.
- Slow-scan television equipment. Not as costly as you might think — your computer can be utilized to display the pictures, and about the only thing that's needed is an interface between the transceiver and computer. The cost is about $50 to $200.
- Fast-scan television equipment. Although television cameras will cost about $200 to $1000, the remaining equipment is not that expensive — about $200 to $400. The additional equipment converts the camera output into a miniature television station.
- Other special-purpose equipment — from $.99 to $50,000.

A hint about equipment: Many hams buy off-the-shelf equipment; other hams make their own. There are many magazines devoted to ham radio that offer equipment designs, even to the extent of providing kits of parts. It's possible to build a fully functioning ham station with receiver and transmitter that can use Morse Code to communicate world-wide — all for under $100!

A	.-	**N**	-.
B	-...	**O**	---
C	-.-.	**P**	.--.
D	-..	**Q**	--.-
E	.	**R**	.-.
F	..-.	**S**	...
G	--.	**T**	-
H	....	**U**	..-
I	..	**V**	...-
J	.---	**W**	.--
K	-.-	**X**	-..-
L	.-..	**Y**	-.--
M	--	**Z**	--..

1	.----	**period**	.-.-.-
2	..---	**comma**	--..--
3	...--	**?**	..--..
4	....-	**error**	....
5	.....	**dash**	-....-
6	-....	**wait**	.-... (AS)
7	--...	**end msg**	.-.-. (AR)
8	---..	**transmit**	-.- (K)
9	----.	**sign off**	...-.- (SK)
0	-----		

Table 1: International Morse Code

And Now the Catch . . .

Ah, government red tape. The radio spectrum, like other resources, is finite. There's intense competition among the broadcast industry, commercial radio services, radio equipment manufacturers, the cellular phone industry and others to carve up that spectrum into usable parts. Because of this, amateur radio is allocated *ham bands*. To operate in these ham bands, you'll need an amateur radio license. And to get that license, you must pass a test to prove that you know how to use the ham bands responsibly.

A little history: For years hams were policed by the Federal Communications Commission for purity of signals, proper operating procedures, and proper language. (While you could say,"Frankly, Scarlett, I don't give a darn," the movie version would not be permitted.) When the CB band was established for the general public, policing was discarded and chaos ensued — foul language, illegal power limits, interference to other stations, and the like. Because of this debacle (and FCC budgets), amateur radio today is less stringently policed, and qualifying tests are easier. You can learn enough in a weekend to get a *Novice* license — the lowest level of amateur radio license. *All* of the 110 possible questions for this 30-question, multiple choice test are *published*. In fact, though it's not the right way to do it, many aspiring hams memorize the correct answers to the pool of all 110 questions.

And Now for Another Catch . . .

The FCC recently extended Novice privileges so that voice is permitted on some high-frequency bands (previously only code was allowed on these bands). Therefore, with a weekend of work, you can have your Novice license and be ready to operate world-wide or locally. However, there's a catch.

When amateur radio was first initiated, the FCC required the knowledge of Morse code. In those days, Morse code communication was used extensively and was the most reliable form of communication when faced with static and noise. Also, the FCC thought a pool of code-trained operators would be a boon during war time, and indeed, that turned out to be the case during World Wars I and II and the Korean War.

Today, Morse code is still widely used on ham bands. Using code under the right conditions, it's possible to contact other hams anywhere in the world with as little as five watts of power. However, while more sophisticated equipment probably eliminates the need for a pool of highly-trained Morse code operators, the Morse code requirement remains a part of the licensing test. Not only does an aspiring Novice have to pass the written test, he or she must receive code at five words per minute. The next level, General class, of license requires reception of code at 13 words per minute. The highest amateur radio license, Amateur Extra Class, requires reception of plain text code at 20 words per minute.

Believe it or not, it is possible to learn to decipher Morse code in a weekend — well enough to pass the Novice test, anyway. The rest of this column offers you a program that teaches Morse code.

The Parameters of Morse Code

The International Morse code used on ham bands and given in the tests is a modification of the original code used by Samuel Morse of telegraph fame. As you're aware from watching the Late Movie, telegraph code is a series of clicks. Ham-band Morse, though, consists of a series of long and short tones. While a short tone is called a *dot*, a longer tone is called a *dash*. The basic dot length is the standard unit used for timing. A dash is three times the length of a dot. The spacing between a dot and dash is one dot length. The spacing between individual characters is one dash length, or three dots. The spacing between words or groups is seven dots.

The code for alphabetic characters, digits and commonly used punctuation is given in Table 1.

Note that all alphabetic characters are uppercase only. There are many more special characters, but these will handle almost all text received and will suffice for the FCC code tests. The code test is a multiple choice test about the text received (i.e., the amateur's name, location, etc.). A typical text might look like the this:

WD6CTY DE K9BCA — HELLO, JOHN. NAME HERE IS FRANK.

WE ARE LOCATED IN INDIANAPOLIS. RUNNING 100 WATTS

WITH AN END FED ZEPP. THE WEATHER HERE IS RAINY.

BACK TO YOU, JOHN. AR WD6CTY DE K9BCA. K

A typical sentence (such as *The quick brown fox jumped*

NEW FOR OS-9™: *FORTH09* ™

from D. P. JOHNSON

FORTH09 is a FORTH-83 Standard implementation specially taylored for OS-9. Includes the double number extension word set, system extension word set, complete forth 6809 assembler and more. Programs written in forth can instantly be saved as compact executable machine language modules. The FORTH09 system runs on any level I or level II OS-9 (6809) machine with at least 32k of available memory and one disk drive. Saved Forth09 application code is romable, reentrant and fully position independent, requiring as little as 3k for a small program. Where maximum speed is required the user can force small code words to be automatically compiled as in line code rather than subroutines. Supplied with complete printed documentation. **$150.00** (+ $3 S&H) Specify disk format if other than CoCo OS-9 format desired.

Other OS-9 SOFTWARE from **D. P. JOHNSON**

L1 UTILITY PAK - Contains 40 useful utilities that run under both level I and II OS-9. Included are a complete set of "wild card" file handling utilities, a disassembler, a disk sector editor, and the MacGen command language compiler. MacGen will allow you to generate many useful command macros in minutes, much more useful than procedure files. Macro source is included for a macro to implement an archival backup type function. **$49.95**

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PC-XFER UTILITIES - Programs to format and transfer files to/from MS-DOS™ diskettes on CoCo under OS-9. (Requires either SDISK or SDISK3 to run depending on which level of OS-9 you are using) **$45.00**

MSF - MS-DOS disk format file manager. More complete file transfer capabiltites for level II only. (Requires SDISK3 to operate).
Now supports 720K 5-1/4" and 3-1/2" MS-DOS Formats. **$45.00** MSF+SDISK3 together **$65.00**

All diskettes are in CoCo OS-9 format unless otherwise requested; other OS-9 formats can be supplied for $2.00 additional charge. All orders must be prepaid or COD, VISA/MC accepted, add $1.75 S&H for first software item, + .25 for each additional item, additional charge for COD.

D. P. Johnson, 7655 S.W. Cedarcrest St., Portland, OR 97223 (503) 244-8152 (For best service call between 9-11 AM Pacific Time, Mon.-Fri.)

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over the lazy dog's back.) would be encoded with the spacing shown in Figure 1.

Note that the Morse code is a very efficient code. The most commonly used characters are the shortest. For example, the letter E is the most commonly used letter in the English language, and it is only one dot in length. The infrequent Z is allocated 11 dot lengths.

The following equation explains the relationship between the number of words per minute (WPM) and the number of dots per minute:

speed (WPM) = dots per minute / 25 = 2.4 x dots per second

In Figure 1, for example, the total time to complete all characters — not counting the period — is 232 dot times (assuming each dot is a dot and space) and there are 10 words. If this text is sent at five words per minute, then a minute's worth of text is 232 divided by 2 (116) dot times. If we divide 116 dot times by 25, we get 4.6 words per minute — fairly close to the formula.

In fact, if text is sent at a slow speed, such as five words per minute, it's difficult to keep these proportions — the dot and dash sound much too long. (A dot is about one-half second at this speed.) Therefore, code transmission at this speed is often adjusted for a quicker dot and dash, while keeping the total number of characters per second the same (i.e., there are longer spaces between characters). This works to the benefit of new code students, as they have a longer time to search their memories for the character.

A Morse Code Program

A program to send code groups is easy to implement in BASIC. (See Listing 1). The `SOUND` statement outputs a sound for a duration equal to multiples of about one-sixteenth second. Since a dot would require 1/16 + 1/16 or ⅛th second, the top code speed in BASIC is about 2.4 x 8, or 19.2 words per minute. However, with the overhead of a larger program, the effective code speed drops to about 15 words per minute. This is enough to get by even the amateur General class code test. (CoCo 3 users can use the clock speed up to get about 70 percent faster code, but I haven't calibrated this .)

Characters can be encoded in the BASIC program as strings of dots and dashes. To make the access time equal for all characters, these strings are put into an array called `CH$`. (See lines 330 to 470 in the listing.)

The first string group represents alphabetic characters. The second group of strings represents the numeric digits. A third group of characters are the special characters shown in Table 1. The special characters can be accessed from the keyboard as follows:

Key	Character	Meaning
.	.	normal period
,	,	normal comma
?	?	normal question mark
-	-	normal dash
!	....	error character — disregard last character sent
“	.-...	AS — wait
#	.-.-.	AR — end message
$	...-.-	SK — signing off
space	space	normal space

The `CH$` array has a one-to-one correspondence with the ASCII characters. For those ASCII characters that do not have a representation in Morse code, a null (empty string) is stored. The output character subroutines are found in lines 710 to 820 in the listing. The output character subroutine is entered with the ASCII character in `A$`. This character is converted to an index value by `ASC(A$)` and then used to access the `CH$` table, which holds the string of dots and dashes. If a null string is found, there is no equivalent dot/

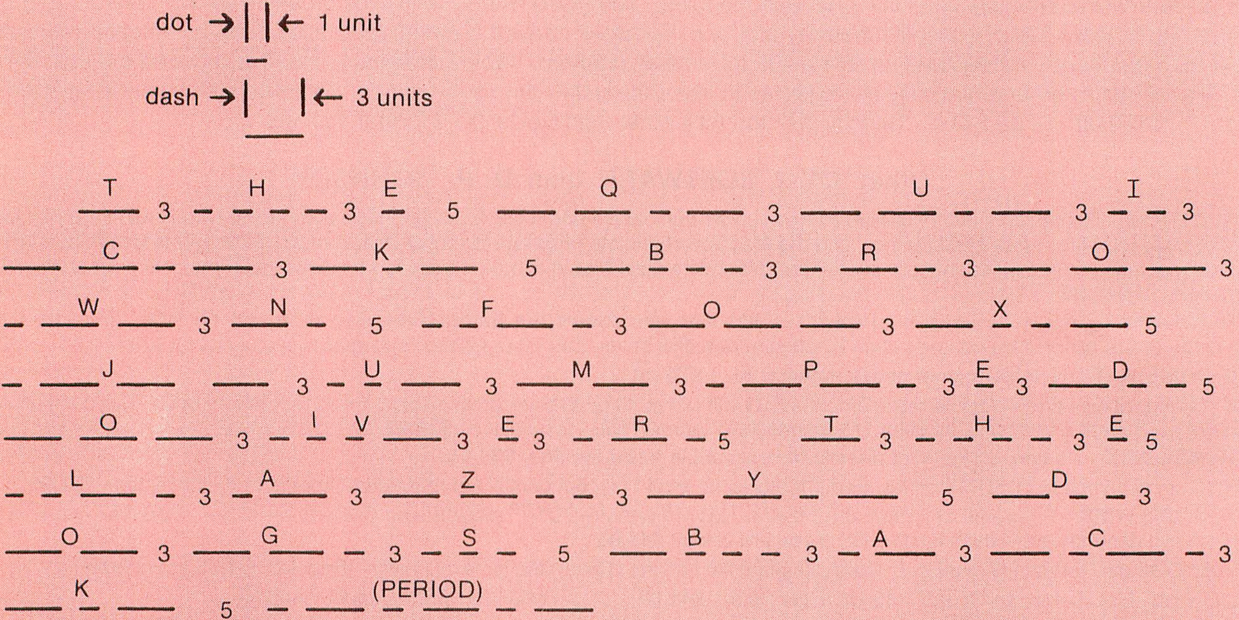

Figure 1: Spacing for Typical Morse Code Text

dash string, and nothing is done. If the string is "", the character is a blank, and a five-dot pause is performed. If a valid string is found, the string is output by using `SOUND` statements. The `SOUND` command is used to generate either a dot or a dash at a specified frequency value. The Frequency Value `F` does not affect the duration of the sound. A one-dot pause is performed after each dot or dash, and a three-dot pause is done after each complete character.

Because there is some overhead in the BASIC program, which affects the timing, individual values are used for the one-dot pause, three-dot pause, five-dot pause, dot-sound duration, and dash-sound duration. These values are initialized based upon the code speed required. Arrays `D1`, `D3`, `D5`, `S1` and `S3` hold 12 values, corresponding to code speeds of three to 15 words per minute. Variables `L1`, `L3`, `L5`, `T1` and `T3` are set to proper values from the arrays through the use of the code speed as an index value.

Using the Morse Code Program

Morse Code Trainer is easy to use. Running the program clears the screen and prints a title message. The program then asks for the `SOUND` frequency value. Pick a value that sounds comfortable to you. If you pick none, a default value of `97` is used. Following is an example of the title screen and the possible responses:

```
Morse Code Trainer
Frequency: 90
Speed in WPM (3 -15): 15
Random Groups (R) or Text (T):
```

The program next asks for the code speed to be used. Code speeds of three to 15 words per minute may be entered. Next, the program asks for the type of code to be sent. If you select `T`, for text, the program will ask for the text to be set. Enter any string of characters up to 255 characters:

```
Text:?THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S
BACK.
```

The program will send the text and display the dots and dashes used as it does so:

```
Text:? THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S
BACK.
.... . --.- ..- .. -.-. -.- -... .-. --- .-- -.
```

The prompt for random groups or text will then be repeated. If you choose the random groups option, random characters from all permissible characters will be sent, in eight-letter groups. The characters will display on the screen as they are being sent, so you can verify them after receiving a page or so of text. These characters will include the special characters such as Error and End Message, which will display as the characters !, ", #, $, and %. Thus, if you press R when prompted to choose between random groups and text, your computer will generate a series of letters and numbers similar to the following:

```
4X5I76E9 .GEJOB#- 9DZBKOLA B1WCR7P4 MYE-S3XP
JWEG.GFU WYC!,Z!, OL0T!ZM3
```

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More on How to Become a Ham

The program should help you overcome that five-word-per-minute FCC code test. Together with some intensive study of the test questions, you could pass your Novice-class license in a matter of days. As a matter of fact, I'm so bullish about amateur radio and computers that I'd be willing to help. As a holder of an Amateur Extra license (AA6CM), another examiner and I can administer the test. If you live in the Los Angeles/Orange/Riverside county area in Southern California, drop me a line at P.O. Box 3568, Mission Viejo, CA 92692. I'll be happy to help.

There are a number of publications devoted to Amateur Radio that will also be of interest. The unofficial organization for hams is the American Radio Relay League (ARRL), Newington, CT 06111. Contact it for general information. Magazines that might be of interest include the following:

QST, ARRL	Monthly publication — available by subscription or in libraries.
CQ	Available from CQ Publishing Company, a monthly publication — available at many newsstands.
73 Magazine	Available from WGE Publishing, a monthly publication — available at many newsstands

Books and courses of interest include the following:

Shortwave Listening Guide, William Barden, Jr., Radio Shack, Cat. No. 62-1332 — Contains several sections on amateur radio. *Packet Radio: Digital Communications with Amateur Radio*, Radio Shack, Cat. No. 62-1084 — Discusses new radio technology. *Novice Voice Class FCC License Preparation*, Radio Shack, Cat. No. 62-2402 — manual and code cassette tapes. *Technician Class Amateur Radio Manual*, Radio Shack, Cat.No. 62-2403 — Manual for Technician class license. *General Class FCC License Preparation*, Radio Shack, Cat. No. 62-2404 — Manual and code cassette tapes.

See you next month with more CoCo topics. ☐

The listing: `MORSE`

```
100 ' MORSE CODE TRAINER.
110 ' SENDS MORSE CODE AT RATES
OF 3 TO 15 WORDS PER MINUTE.
120 ' COPYRIGHT 1988 WILLIAM BAR
DEN, JR.
130 '
140 K = 0: L = 0: L1 = 0: L3 = 0
: L5 = 0: L7 = 0: T1 = 0: T3 = 0
150 DIM CH$( 127 )
160 DIM D1( 15 ), D3( 15 ), D5(
15 )
170 DIM S1( 15 ), S3( 15 )
180 ' SET SPEED PARAMETERS
190 FOR I = 3 TO 15: READ D1( I
), D3( I ), D5( I ), S1( I ), S3
( I ): NEXT
200 DATA 290, 870, 1450, 3, 9
210 DATA 181, 538, 891, 3, 8
220 DATA 126, 366, 612, 3, 8
230 DATA 110, 300, 460, 2, 7
240 DATA 80, 214, 338, 2, 7
250 DATA 70, 168, 270, 2, 6
260 DATA 66, 156, 250, 2, 5
270 DATA 63, 144, 228, 2, 5
280 DATA 40, 92, 144, 2, 5
290 DATA 53, 118, 182, 1, 4
300 DATA 48, 106, 158, 1, 4
310 DATA 44, 93, 136, 1, 4
320 DATA 40, 80, 112, 1, 3
330 ' CLEAR CHARACTER ARRAY
340 FOR I = 0 TO 127: CH$( I ) =
"": NEXT
350 ' READ IN ALLOWABLE CHARACTE
RS
360 DATA ".-", "-...", "-.-.", "
-..", ".", "..-.", "--.", "...."
370 DATA "..", ".---", "-.-", ".
-..", "--", "-.", "---", ".--."
380 DATA "--.-", ".-.", "...", "
-", "..-", "...-", ".--", "-..-"
390 DATA "-.--", "--.."

400 DATA "-----", ".----", "..--
-", "...--", "....-"
410 DATA ".....", "-....", "--..
.", "---..", "----."
420 FOR I = 65 TO 90: READ CH$(
I ): NEXT
  'A-Z
430 FOR I = 48 TO 57: READ CH$(
I ): NEXT
  '0-9
440 ' ADD SPECIAL CHARACTERS
450 CH$( 46 ) = ".-.-.-": CH$( 4
4 ) = "--..--": CH$( 63 ) = "..-
-.."
460 CH$( 45 ) = "-....-": CH$( 3
3 ) = "........": CH$( 34 ) = ".
-..."
470 CH$( 35 ) = ".-.-.": CH$( 36
```

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```
 ) = "...-.-": CH$( 32 ) = " "
480 CLS
490 PRINT "MORSE CODE TRAINER"
500 PRINT: PRINT
510 INPUT "FREQUENCY:"; F
520 IF F = 0 THEN F = 97
530 INPUT "SPEED IN WPM (3 - 15)
:"; S
540 IF S < 3 OR S > 15 THEN GOTO
 530
550 L1 = D1( S ): L3 = D3( S ):
L5 = D5( S ): L7 = L5 * 1.4
560 T1 = S1( S ): T3 = S3( S )
570 INPUT "RANDOM GROUPS (R) OR
TEXT (T): "; RT$
580 ' TEXT HERE
590 IF RT$ <> "R" AND RT$ <> "T"
 THEN GOTO 570
600 IF RT$ = "R" THEN GOTO 650
610 IF RT$ = "T" THEN INPUT "TEX
T:"; TX$
620 FOR I= 1 TO LEN( TX$ ): A$ =
 MID$( TX$, I, 1 ): GOSUB 720: N
EXT
630 PRINT
640 GOTO 570
650 ' RANDOM GROUPS HERE
660 CT = -1
670 CT = CT + 1: IF ( ( CT AND &
H7 ) = 0 ) THEN A$ = " ": PRINT
" ";: GOSUB 720
680 A = RND( 127 ): IF CH$( A )
= "" THEN GOTO 680
690 IF A = 32 THEN GOTO 680
700 A$ = CHR$( A): PRINT A$;: GO
SUB 720: GOTO 670
710 ' OUTPUT CHARACTER SUBROUTIN
E
720 A$ = CH$( ASC( A$ ) ): IF A$
 = "" THEN GOTO 760 ELSE IF A$ =
 " " THEN           GOSUB 820: G
OTO 760
730 IF RT$ = "T" THEN PRINT A$ +
 " ";
740 FOR L = 1 TO LEN( A$ ): IF M
ID$( A$, L, 1 ) = "." THEN SOUND
 F, T1: GOSUB         780: NEXT EL
SE SOUND F, T3: GOSUB 780: NEXT
750 GOSUB 800
760 RETURN
770 ' PAUSES ONE DOT WORTH
780 FOR K = 0 TO L1: NEXT: RETUR
N
790 ' PAUSES THREE DOTS WORTH
800 FOR K= 0 TO L3: NEXT: RETURN
810 ' PAUSES FIVE DOTS WORTH
820 FOR K = 0 TO L5: NEXT: RETUR
N
```

Armchair Admiral

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OS-9 Memory Explorations

By Richard A. White
Rainbow Contributing Editor

The CoCos 1 and 2 support only 64K of memory, which is all OS-9 Level I is designed to use. The Level I Kernel and `OS9Boot` load in from the *top* of this memory, and necessary system data space is allocated from the *bottom* of memory. The free memory in between is available for program modules and their data spaces. With a fairly small system, about 45K is available for your applications. That isn't much these days, even for some single-tasking programs, so the dream of multitasking was not realized under Level I.

With the arrival of the CoCo 3 with 128K (expandable to 512K), multitasking hopes bloomed, and these hopes have been realized to various degrees. I qualify this statement because there are limits. You can do only so much under Level II with 128K of memory; 512K, however, opens most of the doors and allows multitasking undreamed of in the MS-DOS world. (That's probably why MS-DOS machine owners don't believe anything we say about OS-9.) But even here there are limits.

First, a 6809 microprocessor has only a 16-bit memory bus; it can address only 64K of memory at a time. That means that it can directly specify only 65,535 separate memory addresses. To use 128K or 512K of RAM, there must be some game going on in the CoCo 3. The game is *memory management*, and the manager is the GIME chip.

Richard White lives in Fairfield, Ohio, has a long background with microcomputers and specializes in BASIC *programming. With Don Dollberg, he is the co-author of the* TIMS *database management program.*

Memory Management

The GIME switches 8K blocks of memory in and out of the microprocessor's memory space at the instruction of the 6809 chip. Let's try to explain this more simply. When we consider the CoCo 1 and 2, we should think of the 16 memory leads from the 6809 as connecting directly to the memory chips. By choosing which leads have a high voltage (about 3V+), the microprocessor defines which of the 65,535 available memory locations it will read or write to.

When considering the CoCo 3, think of the microprocessor memory leads as connected to the GIME chip rather than directly to the memory chips. Therefore, the GIME chip connects to the memory chips and can select any of the 128K or 512K addresses, depending on the machine's memory. The GIME chip does this by dividing memory into 8K blocks and mapping eight of these blocks at one time into the microprocessor's memory space. The chip can map any 8K block into any 8K portion of the microprocessor's memory space. When the microprocessor addresses a memory location, the GIME knows the memory block's location and addresses that memory location for the microprocessor.

Actually, the GIME chip is not all-seeing. OS-9 manages what blocks will be used when a module is loaded and keeps track of these memory assignments. When OS-9 starts a particular application, it tells the GIME which blocks to map into the microprocessor's memory space, and it tells the 6809 which address to load for its next instruction.

There Are Limits

This procedure has much value in OS-9 Level II's operation on the CoCo 3. First, an application and its directly addressable data space must use less than 64K. This space does not include screen memory. Because 6809 code is very space-efficient, the limit is not serious. However, it does mean that large programs with many bells and whistles (typical in the MS-DOS world) will not be created for the CoCo.

The 64K limit applies to the OS-9 system code as well. When you use a system function (like making disk access to save or load), all of the Kernel, OS-9's boot and varying amounts of data space must be mapped into the microprocessor's 64K space. Further, certain utilities, like `Format`, use several blocks in the system's 64K space to run.

Those who sharpened their teeth on Level I on a CoCo 1 or 2 may ask, so what? Just as work expands to fill the time available, so code expands to fill the memory available. `OS9Boot` seems to want to grow like a puppy, and many of us with 512K have gotten the dreaded

Memory Full error when we thought we had memory to spare.

The root of the problem is our desire to make a boot all things to all programs. Because of this desire, we include most of the drivers and descriptors known to mankind. Often, a game will come with one or two special modules that must be in the system space if not actually in `OS9Boot`. Memory economy suggests that these modules be in `OS9Boot`, which grows with each new game until a Memory Full error signals that enough is enough. There are limits. We cannot use memory indiscriminately forever, but with some smarts and discipline we can get along comfortably.

The total-memory limit is very real in a 128K machine. Indeed, multitasking with major applications is not practical, and Hi-Res graphics application is tight. Multiple *windows* under 128K eat substantial amounts of memory before you can even load multiple *applications*. Radio Shack's OS-9 games and applications, such as *Home Publisher*, show that graphics-based programs can be run in 128K with careful programming and compromises. In the case of *Home Publisher*, speed is compromised to fit 128K. Still, it is better to do something slowly than not do it at all.

512K of memory seems inexhaustible. Not so. Most of us are guilty of thinking that since things run faster if already in memory, we should load them on boot and have them there when needed. While this is good to a point, things start getting scary when `MFree` tells you there is only 48K left of the original 512K. I found that with *Multi-Vue*, I could devour 200K without breathing hard. Even at 512K, some discipline and memory-conservation strategies are needed.

Let's return to the 8K-block memory organization imposed by the GIME chip. When OS-9 loads an executable module, it loads the code at the beginning of an unused 8K block and uses as many blocks as needed. All blocks that are used, even one using just one byte, are unavailable for any other use as long as that module remains in the machine. When the module is unlinked, those blocks are returned and can be used for something else.

All of the utility modules provided with OS-9 — such as `Copy`, `Dir`, `Format`, etc. — are smaller than 8K. (Some are smaller than 100 bytes.) OS-9 hackers love to write and rewrite utilities, so there are many utilities smaller than 8K available. Many of these are useful enough to merit loading onto the boot, but if you load your utilities individually, each will take an 8K block.

Earlier, I said that when OS-9 loads an executable module, it starts with a new 8K block. I should have said executable *file*, which can contain more than one module.

Save Memory With Merge

I have described the `Shell` file that comes with OS-9 Level II. The technique used in the file is the key to major memory savings in a Level II system. The `Shell` file contains `Shell` itself and 19 other frequently used utilities. It is 7,741 bytes long. Therefore, it will fit comfortably into an 8K block, and OS-9 will load it into only one 8K block. This file was made using `Merge` by entering the following at the `OS9:` prompts:

```
chd WORKING
merge shell copy ... >shell.temp
del /d0/CMDS/shell
copy shell.temp /d0/CMDS/shell
```

FILE TRANSFER UTILITIES

XXX: Reviews - December Rainbow Dale Puckett - November Rainbow. XXX

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PCDUMP	display PC disk sector	RSDUMP	display RSDOS disk sector
PCREAD	read file from PC disk	RSREAD	read file from RSDOS disk
PCWRITE	write file to PC disk	RSWRITE	write file to RSDOS disk
PCRENAME	rename PC file	FLEXDIR	directory of FLEX disk
PCDELETE	delete PC file	FLEXDUMP	display FLEX disk sector
PCFORMAT	format PC disk	FLEXREAD	read FLEX file
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Here we start assuming that the modules you want to merge are copied to a directory different than your `CMDS` directory. Begin by changing your current data directory to `WORKING`. Then use `Merge` to combine `Shell` and the other modules you want to include into a new file named `Shell.temp`. (You already have `Shell` in the directory and cannot use *that name* again.) You would do this if you wanted to remove some modules that come in the original shell file, like `Deiniz`, `Merge`, etc. Next, delete the shell file presently in your `CMDS` directory, and move your new file to that directory. Remember that your new file must be named `Shell` in the `CMDS` directory, so OS-9 can find it when booting.

We've done everything except some picky little details that the computer will think are vital. First, we forgot to set the `e` and `pe` attributes on the new shell file (a small but fatal error). That disk won't boot again until those attributes are set.

Want a laugh? I did just that last week, but the shell in question was on my *hard* disk. At that point, I couldn't use my hard-disk driver and `/h0` descriptor to boot OS-9 with a disk having an `OS9Boot` file. So I couldn't access the hard drive to set the attributes on `Shell`, and without the attributes set, I couldn't get a boot that would access the hard disk, and so on, and so on . . . . Things began to look serious. The solution was to find a disk with a floppy-only boot file. (Moral: Keep copies of old boot disks in an archive somewhere.) Then I had to load the hard-drive driver and its descriptor separately. Of course, I could not find the floppy I used in making the original descriptor, so I had to make a new descriptor and hope I could get it right without too much trouble. Maybe picky little details aren't that little.

Setting attributes is simple enough. Make sure that `Attr` is in your current `CMDS` directory. Then enter the following at the `OS9:` prompts:

```
chd /d0/CMDS
attr shell e pe
```

The computer will respond with the following:

```
--e-rewr
```

This procedure changes your current data directory to `CMDS`, and issues the `Attr` command with the `e` and `pe` parameters. `Attr` reports the new attribute settings with the `--e-rewr`

```
    Blk     Begin    End      Blks     Size
    ---     -----    ---      ----     ----
     8      10000    1DFFF     7       56k
                     ====     ====    ======
                     Total:    7       56k

    OS9:
```

Table 1

```
Bk     Ofst    Size    Ty     At     Link   Module Name
--     ----    ----    --     --     ----   -----------
-3F    D06     12A     C1     81     0      REL
 3F    E30     1D0     C1     81     1      Boot
 3F    1000    ED9     C0     88     0      OS9p1
- 1    300     CAE     C0     82     1      OS9p2
  1    FAE     2E      C0     81     1      Init
  1    FDC     9F3     C1     81     1      IOMan
  1    19CF    122E    D1     81     B      RBF
  2    BFD     454     E1     81     B      CC3Disk
  2    1051    30      F1     81     B      D0
  2    1081    30      F1     81     0      D1
  2    10B1    30      F1     81     0      DD
  2    10E1    5E3     D1     81     2      SCF
  2    16C4    C36     E1     81     2      CC3IO
  3    2FA     CE5     C1     81     1      VDGInt
  3    FDF     D3D     C1     81     0      GrfInt
  3    1D1C    45      F1     81     2      TERM
  3    1D61    42      F1     81     0      W
  3    1DA3    43      F1     81     0      W1
  3    1DE6    43      F1     81     0      W2
  3    1E29    43      F1     81     0      W3
  3    1E6C    43      F1     81     0      W4
  3    1EAF    43      F1     81     0      W5
  3    1EF2    43      F1     81     0      W6
  3    1F35    43      F1     81     0      W7
  3    1F78    3B5     E1     81     0      ACIAPAK
 3F    32D     3F      F1     81     0      T2
 3F    36C     17A     E1     81     0      PRINTER
 3F    522     185     E1     81     0      SIO
 3F    6A7     39      F1     81     0      T1
 3F    6E0     219     D1     81     0      PipeMan
 3F    8F9     28      E1     81     0      Piper
 3F    921     26      F1     81     0      Pipe
 3F    947     1EE     C1     81     2      Clock
 3F    B35     1AE     11     1      1      CC3Go
- 6    0       5FC     11     81     2      Shell
  6    5FC     2E7     11     81     0      Copy
  6    8E3     FD      11     81     0      Date
  6    9E0     A5      11     81     0      Del
  6    A85     84      11     81     0      Display
  6    B09     22      11     81     0      Echo
  6    B2B     7A      11     81     0      Iniz
  6    BA5     2C      11     81     0      Link
  6    BD1     4F      11     81     0      List
  6    C20     24      11     81     0      Load
  6    C44     1EB     11     81     0      Mfree
  6    E2F     118     11     81     0      Setime
  6    F47     1B1     11     81     0      MMap
  6    10F8    1A7     11     81     1      DirM
  6    129F    26C     11     81     0      Paths
  6    150B    201     11     81     0      PMap
```

Table 2

string. This means permissions are granted for public execute and read, and owner execute, write and read.

Next, make sure that when you merge a number of modules together, the final file length does not pass an 8K — or 8,192-byte — boundary. The shell file that comes with OS-9 Level II is 7,741 bytes long, so it will only use one 8K block. If the file had been more than 8,192 bytes long, it would have used two blocks, and the second block would contain only a few bytes. The rest would be wasted.

How OS-9 Uses Memory

About two years ago, Kevin Darling wrote some utilities to help him dissect Level II and find out exactly how it worked. These are available on the Delphi OS-9 SIG database and on other bulletin board and information systems. I will use a few of these utilities to illustrate how OS-9 uses memory. For these examples, I will use the boot that comes with the OS-9 distribution package from Radio Shack. I have changed only the shell file, where I eliminated modules I would not need and added some of Darling's utilities. The new shell file is still less than 8K, and all these examples were run in a 128K machine.

The first example is produced by *MMap*. Like `MFree`, *MMap* also reports free memory. However, in addition, this utility produces a map of memory and identifies which blocks are in use and which are free. At the `OS9:` prompt, I entered `mmap`, and my computer generated the following information:

```
 0 1 2 3 4 5 6 7 8 9 A B C D E F
# = = = = = = = = = = = = = = = =
0 U U U U U U M U _ _ _ _ _ _ _ .
1 . . . . . . . . . . . . . . . .
2 . . . . . . . . . . . . . . . .
3 . . . . . . . . . . . . . . . U
Number of Free Blocks: 7
  RAM Free in KBytes: 56
OS9:
```

The memory blocks are numbered in hex and range from 00 to 3F. In the map above, the blocks marked with a period (.) have no memory installed since it is a 128K machine. The block numbered 3F is always assigned to the Kernel. The top two 256-byte pages of this block contain GIME registers and I/O and system interrupts; they are always mapped into the microprocessor's 64K memory space. All applications use certain addresses in these pages to communicate with the operating system, which is not mapped in at this time.

An executable module starts in any block marked with M. The 'M' in Block 06 represents the shell file's location. Blocks marked with a 'U' are used for the operating system, data or the continuation of module files. Finally, the blocks marked with an underscore (_) are free.

This is a minimal Level II boot, using only the 32-character-by-16-line `Term.vdg` display and no other windows. Only 56K remain for applications and graphics. `MFree`, which comes with OS-9, gives the same report given by *MMap*, but without the map. When I entered `mfree` at the `OS9:` prompt, my computer generated the information shown in Table 1.

Darling's *DirM* utility gives a fully detailed listing of module locations in memory, similar to that which `MDir e` yields, but with a few added features like the link count. (See Table 2.)

From this table, we can learn how Level II loads when booting. The Ker-

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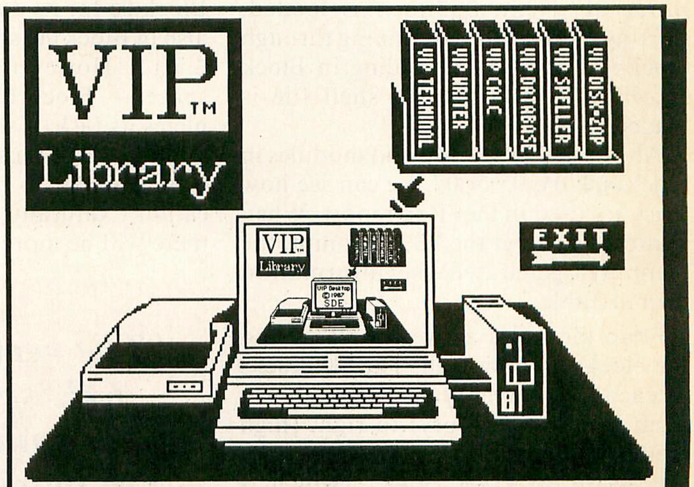

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```
ID    01    23    45    67    89    AB    CD    EF    Program
--    --    --    --    --    --    --    --    --    -------
1     00    ..    ..    04    01    02    03    3F    SYSTEM
2     05    ..    ..    ..    ..    ..    ..    06    Shell
3     07    ..    ..    ..    ..    ..    ..    06    PMap
```

Table 3

```
ID    01    23    45    67    89    AB    CD    EF    Program
--    --    --    --    --    --    --    --    --    -------
1     00    ..    0C    01    02    03    04    3F    SYSTEM
2     06    ..    ..    ..    ..    ..    ..    07    Shell
3     09    11    1C    1D    1E    ..    ..    08    fload
4     1F    ..    ..    ..    ..    1A    1B    ..    PMap
5     0A    ..    ..    ..    ..    ..    ..    07    Shell
6     0E    ..    ..    ..    ..    ..    ..    07    Shell
7     0F    ..    ..    ..    ..    ..    ..    07    Shell
8     10    ..    ..    ..    ..    ..    ..    07    Shell
11    16    17    18    19    12    13    14    15    ds
```

Table 4

nel is shown at the top using part of Block 3F. Next, `OS9Boot` is loaded, starting in Block 01, continuing through blocks 02 and 03 and ending in Block 3F. Finally, our merged shell file is loaded in Block 06.

Although *DirM* shows no modules in blocks 00, 04, 05 or 07, we can see how these are used in the `PMap` report. When I entered `pmap` at the `OS9:` prompt, the computer generated the information seen in Table 3.

`PMap` identifies active processes and the blocks used by each. The 8K blocks of each 64K memory space are shown from left (low memory) to right (high memory). The following three processes are active: `System`, `Shell` (which is running `Term`) and `PMap` (which is generating the above output). `System` is shown in low memory, so it uses Block 00 as a data block. `System` uses five blocks, including Block 4. If we return to the *DirM* report, we see that `ACIAPAK` starts at Byte hex 1F78 in Block 03 and is hex 3B5 bytes long. Since decimal 8K is hex 1FFF, `ACIAPAK` must overlap a block boundary into another block — obviously Block 04. Actually, `ACIAPAK` uses only 814 decimal bytes of Block 04, leaving over 7000 bytes free for `OS9Boot`'s expansion.

We know from *DirM* that `Shell` is in Block 06, but now we see that it uses Block 05 for its data. Note that `PMap` is also in Block 06, sharing that block with `Shell`. However, `PMap` needs a data space — Block 07. When `PMap` completes its task, it will return Block 07 to OS-9 for other uses, so there is really 64K available to run some other application. Naturally, in a 512K machine there will be more room.

> *"The very top of the 64K space must have somewhat over 256 bytes for GIME registers, I/O and interrupts mapped."*

System Growth

Following the General Law of Space Availability, the system will grow. We will add more modules to `OS9Boot` and use windows, so OS-9 must load `GrfDrv` when it sees `Term_win` rather than `Term_vdg` in `OS9Boot`.

The following is a `MMap` report of memory usage in my machine at the time I write this:

```
  0 1 2 3 4 5 6 7 8 9 A B C D E F
# = = = = = = = = = = = = = = = =
0 U U U U U M U M M U U M U U U U
1 U U M M M M U U U U M M U U U U
2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
3 _ _ _ _ _ _ _ _ _ U U U U U U U
Number of Free Blocks: 25
  RAM Free in KBytes: 200
```

As we move up from the bottom of memory, we see that modules and their data blocks are assigned to 8K blocks of memory. Block 3F is a system block like one in a 128K machine. Blocks 39 through 3E are window memory. I have three text windows, one graphics window and `Term` currently active. Table 4 shows the process map that `PMap` would report in the situation I have described.

Notice that `System` has grown. My hard-drive system needs over 6K of space in `OS9Boot`. The new and different drivers I introduced into `System` have made a definite difference. Notice, too, that there are five shells, one for each window and one for `Term`. `PMap` has been merged with another module that takes over 8K. That whole file takes two blocks, both of which are mapped into the 64K memory space.

`FLoad` is the loader file for D.P. Johnson's *Forth09*. The rest of the language and data spaces are found in the lower part of the memory space. *DS* is my word processor and its data blocks.

One other little detail can be seen in my `PMap`. Note that the two blocks containing `PMap` itself are not mapped at the top of the 64K memory space. The very top of the 64K space must have somewhat over 256 bytes for GIME registers, I/O and interrupts mapped. Because the file containing `PMap` is within a few bytes of 16K, there would be no room for the required system addresses if that file were placed in the upper two blocks of the 64K space. In this situation, this makes no difference, but if you want to maximize the data space available for a program, make sure that the last 8K block used by executable code in a file has nothing in the last 512 bytes.

We have seen the value of merging files and limiting boot. Memory management plays a vital role in the effective use of OS-9 Level II. Use the utilities I have described to monitor your system's memory use.

See you next month.

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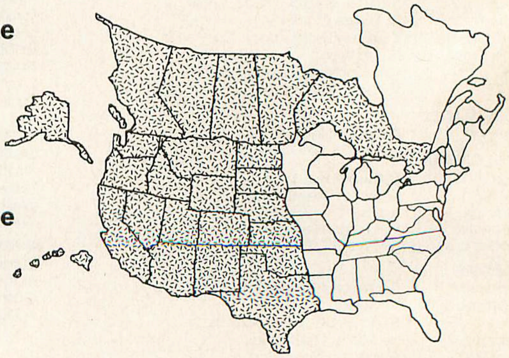

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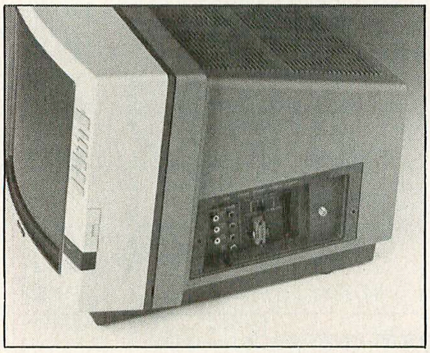

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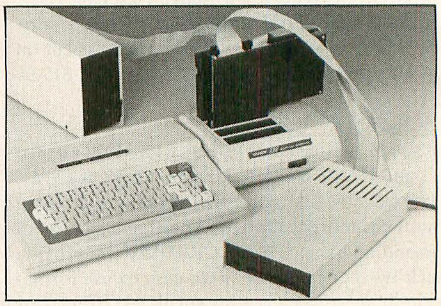

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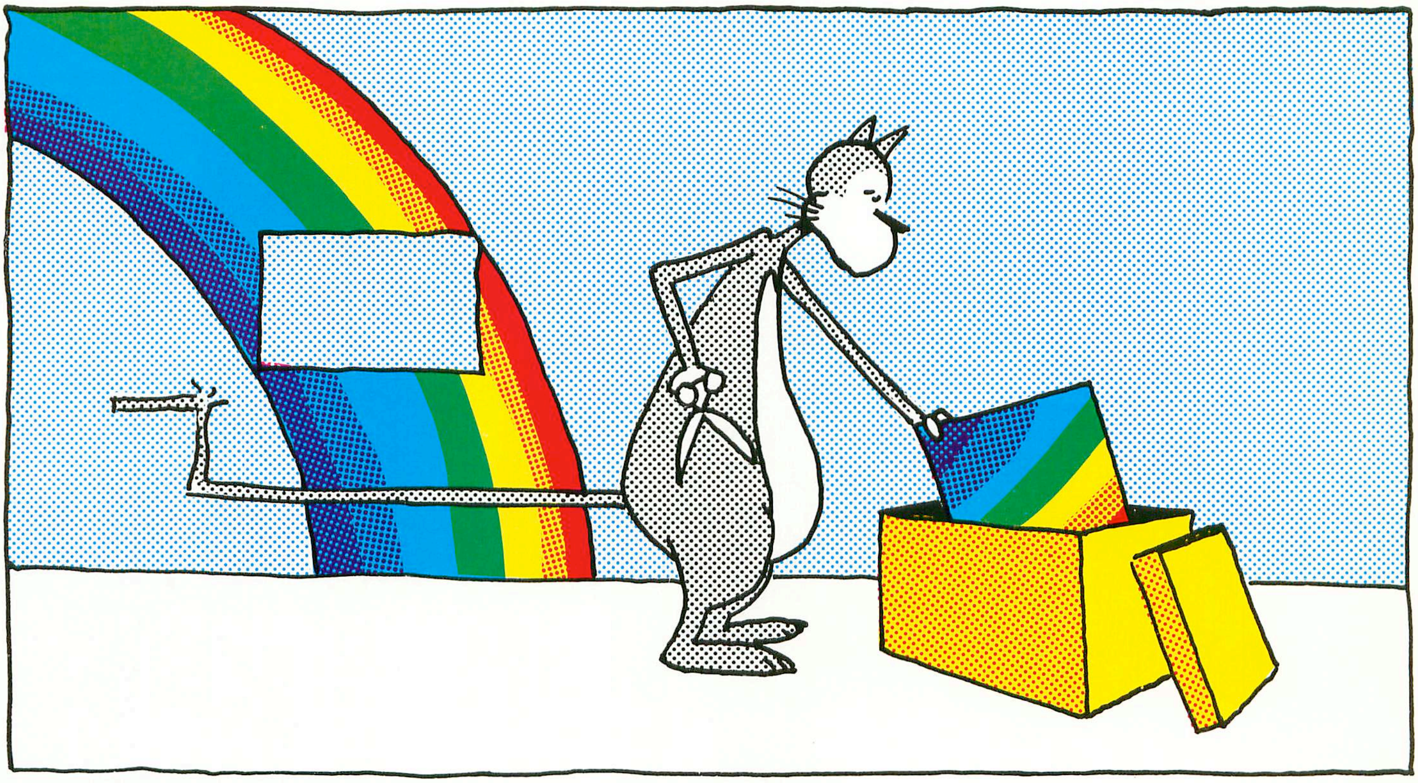

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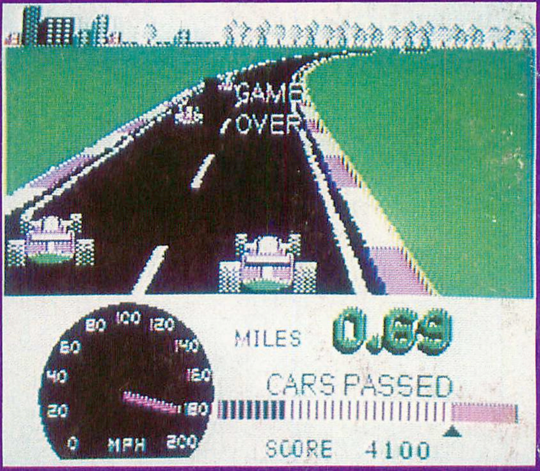

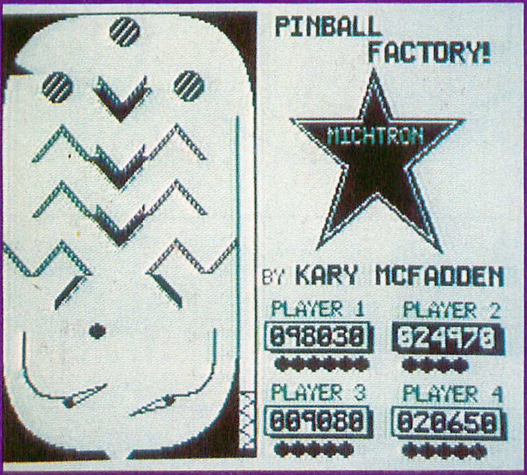

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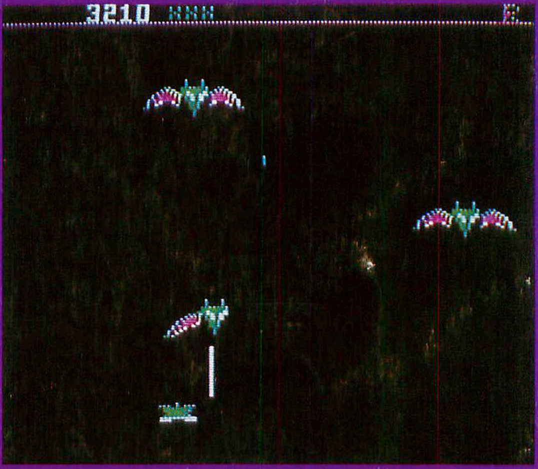

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